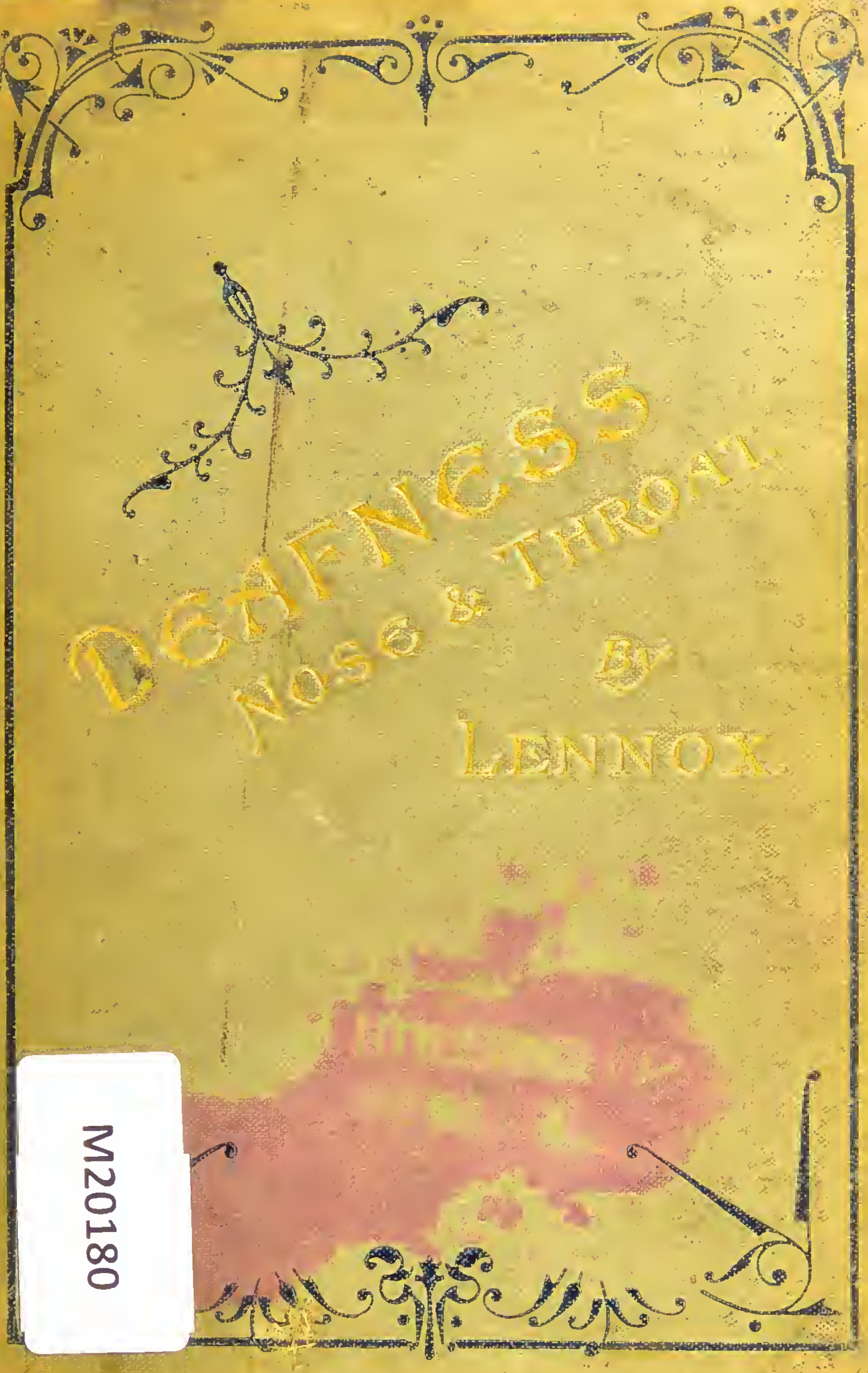

DEAFNESS
NOSE & THROAT

BY

LENNOX

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DEAFNESS

ITS

PREVENTION AND CURE

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ITS

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WITH TREATMENT FOR THE NOSE AND THROAT

2nd ed.

BY

"LENNOX"

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PREFACE TO SECOND EDITION

THE object of this book is to give in plain words an account of the principal diseases of the Ear, with appropriate remedial treatment capable of being applied by the patient.

On few subjects does so great and widespread an ignorance exist as on aural disease; yet good hearing is vital to Happiness and Progress. For seven years I have given advice on the cure of Deafness in the columns of the "Echo", and I have had the satisfaction of receiving the appreciative thanks of several hundreds of people, and my hope is, that this book will, even more surely, serve the same purpose. It is written with riper experience, both practical and theoretical, and I believe it will supply a public need, and help to prevent, as well as mitigate nearly every form of Ear trouble.

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July 1896.

[i.e. Alfred [illegible] Peirson]

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INTRODUCTION

There is scarcely any disease of the present time which has yielded so little result to medicine and surgery, as deafness. This is to be regretted the more, when we reflect that ear disease is one of the most frequent and serious to which suffering humanity may be exposed; for any degree of deafness, destroying as it does, our capability for business or pleasure, and impairing the noblest of our functions—our capability for life among others—must be a serious affliction for human beings in all their relations. The impression of external objects as carried to the brain by the senses, furnishes material to the intellect for the formation of ideas, and in proportion as the impressions of the outer world upon the sensorium are sharp and clear, that is, the more acute our senses are, so much more plainly will our views and ideas express themselves: if, on the contrary, our sensitive perceptions are only partial and undecided, our whole nature will bear the stamp of incompleteness and uncertainty.

Deafness may thus be said to influence the intellectual development, the happiness, and even the duration of life of the individual.

Not less important is the influence which impairment of hearing exerts upon the intellectual development of a child. If man be a creature of circumstances, the reciprocal relation should be considered, which exists between the acuteness of the senses and clearness of thought. *Nil in intellectu quod* *non prius fuerit in sensu,* says Aristotle. The beginning and basis of all knowledge is the sense of experience, and we may ask, by what way is the material for the intellectual development of the child conveyed to him? Undoubtedly through the ear. On this account, impairment of hearing occurring in early life, acquires a more or less permanent influence upon the formation and development of the intellectual nature, according as education and care resist these evil influences. Deaf children are not only unable, except with great difficulty, to concentrate their attention, but they are apt to remain inattentive and fickle, while the want of an acute perception, which is chiefly attained through the ear, renders a closely connected train of thought, and a comprehensive grasping of intellectual and sensuous perceptions, very difficult. People who from early life have been hard of hearing, have generally something in their nature a little foggy, are uncertain and weak in business, illogical and superfluous in thought and speech, abrupt and out of character in their answers. Hence, it is sometimes possible to decide from the speech and bearing of a patient that he has probably not heard well from childhood. And if all this is true of moderate deafness, how much more serious is the result of a high degree of deafness, where a child who does not hear speech cannot learn to speak at all, and grows up practically deaf and dumb, and in the position never to become a really useful member of society. Thus we see that disease of the ear may be ranked among that class of affections exerting the deepest and most destructive influence—certainly a greater influence in these respects than diseases of the eye.

Diseases of the ear are very frequent, much more so than eye disease, the hearing being influenced by so many constitutional affections, as well as local complaints. In childhood, discharges and ear-ache are very common, forming the bane of successive generations. Few people hear equally well with both ears, but the deficiency is not noted, because the ordinary business of life does not require perfect hearing, but it may be safely stated that two out of every three persons between the ages of twenty and forty years of age, suffer from deafness to a greater or less degree. Since, therefore, ear-disease is so frequent, and its results so important, what would be more reasonable than to suppose that a corresponding attention on the part of the medical faculty would arise? Yet we know only too well that it is not so, and even the young medical man is allowed to pass through the sacred portals of qualification, possessing a mere surface knowledge of the anatomy of the ear, and absolutely no knowledge of its pathology. Accomplished physicians, too, know comparatively little of the ear and its diseases. Therefore one of the most important labours of the future, for which there exists so vast a quantity of material, is undoubtedly the study and treatment of the organ of hearing, with special attention directed to the perceptive or nervous element of audition.

The following pages give a lucid account of the principal forms of deafness, with a description of the structure of the ear adapted to the lay mind, but it must be understood, that many cases, especially those of long standing, are incurable, the chief thing being to take the disease in time, for the early application of local treatment, will, in most cases arrest it, and be the means of ultimate cure. If this be the result of my labours, and I am thus the means of helping and alleviating the journey of deaf people along the wearisome road of social ostracism and petty humiliation, that result will give me the greatest pleasure it is possible for a man to experience—the knowledge that his efforts have tended to diminish human suffering and brighten human life.

L. P.

DEAFNESS.

CHAPTER I.

THE STRUCTURE OF THE EAR.

THE better to understand the various forms of Deafness, it is necessary to be acquainted with the structure of the ear itself—to consider the anatomy and physiology of the organ sufficiently to follow with intelligence the treatment laid down.

In the organ of hearing, the physiologist recognises, first, the peripheral part for the conduction of sound; and secondly, the central part, more intimately connected with the perception of sound—*i.e.*, the external, middle, and internal Ear. The auditory apparatus may also be divided into two distinct functions, Hearing and Equilibration, and a lesion of any of the parts will affect each separately, or the two together; but, the most common symptom of aural disease is undoubtedly diminution of hearing power, followed next in order of frequency, by *Tinnitus Aurium* (noises in the ear), which may be described as a disturbance of hearing power.

The Ear, then, is divided into the perceptive and the conductive apparatus. The first is the internal Ear with the expansion of the auditory nerve in the labyrinth; the second being subdivided into the middle and external Ear, separated by the drum-head. The middle Ear comprises the cavity of the tympanum with the ossicles or auditory bones; the mastoid process with its cells, and the Eustachian tube; to be hereafter described.

The external Ear consists of an expanded trumpet-shaped cartilaginous structure called the Auricle, which is a shell of cartilage covered with skin, and supplied with blood vessels, nerves, and lymphatics; and is a continuation of the auditory canal, directed outward in order to receive external sounds. The lower part of the auricle is called the lobe, and is destitute of cartilage, being made up of loose areolar tissue and fat, between two layers of cutis, and the absence of cartilage in this part renders it possible to be pierced for ornaments, without injury, a barbaric practice, happily falling into disuse. The prominent part of the auricle near the cheek-bone, is termed the tragus; the hollow, shell-like depression above the lobe, the concha; the outer rim of the auricle, the helix; and the part inside the helix, and opposite the tragus, is called the anti-helix. The elasticity of the auricle is a very important point, for if it were rigid, that is, made of bone, or even of inelastic cartilage, its exposed position at the side of the head would render it liable to injury. Strange as it may appear, the auricle is not indispensable to good hearing, but is believed to be useful in detecting minute variations of sound; it was at one time considered necessary in the collection and conduction of sound into the auditory canal, in part by reflection, in part by participation, in the sonorous vibration, but it is found that persons who have lost the whole of the auricle, have not suffered to any perceptible extent from diminution of hearing power. It acts as a collector and strengthener of the weaker sounds, and while having no effect on the quantitative conveyance of sound, it affects the qualitative sensation of sound. In common with the external meatus, the Eustachian tube, and the mastoid process, the auricle completes its growth and development at the latest period, while other parts of the auditory apparatus hardly increase in size after birth. Its size and form, and the angle which it forms with the lateral wall of the skull, are subject to great individual variations. Many of these are frequently observed as family characteristics, while many may be considered as national and ethnological peculiarities. Darwin considered the auricle to be rudimentary in man, and this view may be accepted, inasmuch as few people possess the power to move it at will; and it may be added, that the more nearly the brute ear resembles the human, the less developed are the muscles. Small and well set auricles are considered an adornment of the person, and disfigurement by removal in remote times (crop-eared) was as much a part of the punishment as the pain inflicted.

The physiognomist Lavater professed to judge a man's character by his ears, and another Frenchman used to say, "Montre moi ton oreille, je te dirai qui tu es, d'où tu viens, et où tu vas"—*i.e.*, "Do but show me your ear, and I will tell you who you are, whence you come, and whither you are going." Dr. Laycock believed that the shape of the ear affords a clue to the original development of the brain, and that its appearance indicated the condition of the brain structures; but Mr. Jonathan Hutchinson points out that we can hardly follow him so far as to believe that a special state of the ear is associated with general paralysis, and that the adhesion of the lobule to the cheek from birth—which might be purely hereditary in origin—bears upon the occurrence of that disease. We must, however, accept his further dictum that, "the ear affords excellent facilities for observation as to the general state of nutrition and circulation." And that, "the degree of perfection in its form, is a tolerably safe guide as to the descent of the individual from a sound and well-bred stock;" a large and prominent auricle being considered a sign of vulgarity. These physiological peculiarities are, after all, mere matters of opinion; the one thing being certain, that, whatever the shape of the auricle, it is no indication of the hearing power, nor of the power of mind of the individual.

The auditory canal is a tubular continuation of the auricle, and may be likened to a funnel-shaped canal, with its larger end directed outward, its inner end being closed by the membrana tympani (drum-head). It is from 1 to 1⅓ inches in length, varying in different individuals—the outer third being cartilaginous, and the inner two-thirds, osseous.

The passage is curved, its direction being obliquely forward and inward, and somewhat bent downwards towards the middle, so that it is rather higher there than at either extremity. The narrowest part is the isthmus, midway between the auricle and drum-head, chiefly due to the elevation of its floor. This elevation being increased in rheumatic or gouty people. The isthmus is the part which gives so much trouble in extracting foreign bodies from tho ear, if they be lodged beyond it. The canal may be straightened by traction on the auricle—drawing it slightly upwards and backwards, and this is necessary in order to properly view the drum-head, or to syringe the ear. The auditory canal is a continuation of the common integument, and contains sebaceous, perspiratory, and ceruminous glands, and hair follicles; the function of which is the secretion of a glutinous and bitter substance called wax. The healthy secretion of this wax is of the highest importance to the comfort and health of the canal, and of the health of the individual. It prevents morbid growths, and the incursion of insects into the canal; and the "ceruminous circle," which in a state of health should be of a golden-brown colour, is always looked for as diagnostic of a healthy condition of the canal, and may be compared in its protective nature to the lachrymal fluid which moistens the eye, thus bearing upon the human economy. The skin of the canal becomes thinner as it proceeds inwards, and in the osseous portion it is intimately connected with the periosteum. The blood supply is derived from the posterior auricular artery, which sends branches to the auricle; and from the deep auricular artery, which enters at the maxillary articulation. The nerve supply is derived from several large branches of the third cervical, and the auricularis anterior of the third branch of the fifth, and one or two twigs from the sensitive auriculo temporalis nerve from the third division of the trigeminus. The integument, in addition, receives a twig from the jugular ganglion of the pneumogastric, and this share of the nerve in the innervation of the canal of the ear, accounts for certain phenomena, such as coughing, &c., often observed when the canal of the ear is touched with a speculum, probe, or the lodgment of a foreign body.

Many birds have the enviable power of closing their ears at pleasure, by a kind of valve. The turkey possesses an erectile tissue, projecting into the auditory canal, so that it can close the ear more or less perfectly when angered, and a variety of semi-aquatic animals also have the means of closing the ears automatically when entering the water. If this power were possessed by the human species, a very large amount of aural disease might be prevented.

The membrana-tympani or drum-head, forms the partition between the middle ear and auditory canal, and is not quite circular, but of a slightly oval shape, with a mean diameter of ⅓ of an inch, and resembling gold-beaters' skin with a delicate, bluish, semi-transparent appearance, and polished surface, through which the handle of the malleus (first ear-bone), may be seen extending downward and backward to about the centre. Its appearance in health is very beautiful, and it may be likened to a pearl with a ray of light thrown across it. It is inserted in a bony groove at an angle of 55°, and is retracted at its centre (umbo), so as to be concave. At the upper part is a small triangular portion of the drum-head which is not so tense as the rest, which is termed the *membrana flaccida,* and this part is due to a deficiency in the bony groove. As before stated, it has a bright polished appearance during life, and this lustre is especially bright at the antero-inferior part (the umbo), where the first ear bone is embedded in the drum-head, and is called the cone of light, the apex of which is at the umbo, and the base at the lower periphery of the membrane. This cone of light is a very important factor in diagnosing aural disease; and much can be learnt from its inspection in determining the cause of Deafness.

Although so thin, not exceeding the thickness of paper or gold-beaters' skin, the drum-head consists of three layers (except the *membrana flaccida* which is deficient in fibrous tissue), and is composed of (1) A cutaneous or outer layer, which is continuous with the auditory canal, but is destitute of hair or glandular elements of the skin; (2) The inner or mucus layer, continuous with the middle ear; and (3) A middle or fibrous layer, which is termed the *membrana propria,* and is really the strongest layer of the membrane. It is composed of two sets of fibres—an outer or radiating, and an inner or circular, and the malleus is fixed between these fibres. The drum-head serves several purposes. It protects the middle ear from atmospheric irritation, and other external influences. It forms a support for the outer end of the bridge of bones which spans the tympanum. It has great capacity for vibrating in response to sound-waves, and picking up vibrations passing from a gaseous to a fluid medium, which otherwise would be reflected and lost. By certain experiments. the great Helmholtz has proved that a curved membrane has a greater capacity for resonance than a flat one, and it receives vibrations of all varieties of pitch and intensity at one instant, transmitting them along the chain of bones; the non-elastic nature of the membrane preventing the tendency to after-vibration, which would render spoken words a confused babel.

The middle ear or tympanum is a small air-chamber, wedge-shaped in form, with the wedge downwards, so that the floor of the cavity is the narrowest portion. It is surrounded with hard bony walls, and closed externally by the drum-head, and ventilated internally by the Eustachian tube. In length and breadth, the cavity is nearly equal, being about one-third of an inch. The roof is formed of a thin plate of bone, separating the cavity from the meninges (brain-membrane); the thinness of this plate rendering inflammatory processes of the middle ear dangerous to the brain. The broad inner wall of the cavity of the tympanum, is perhaps the most important of all, on account of its relation to the inner ear. It forms the boundary between the middle and internal ears, and the parts composing the latter lie immediately behind it. For the purpose of this book, it will only be necessary to notice two openings in this wall; one being the fenestra ovalis, the other the fenestra rotunda. The first leading to the vestibule, the second to the cochlea, both being parts of the internal ear. The fenestra ovalis is filled in with the base of the stapes (3rd ear-bone); and the opening of the fenestra rotunda is covered by a membrane which separates the tympanic orifice of the cochlea, from the cavity of the tympanum. These two fenestræ are of the highest importance to the function of hearing; for, if either become thickened or rigid, or plugged up by middle ear catarrh, the most intense and incurable deafness will arise. It is plain, that every morbid change which lessens the elasticity of such delicate structures, will lessen the oscillation of the fluid between the middle and internal ears, and secondary nerve deafness will result. The cavity is lined with mucous membrane which is continuous with the Eustachian tube, and consequently with the nose and throat, and which varies in thickness in various parts. This mucous membrane is continuous over the auditory bones, hence, any thickening of the membrane will impair the mobility of the bones, producing anchylosis, thus setting up that impairment of hearing so characteristic of chronic aural catarrh.

The ossicles or auditory bones, already frequently referred to, are three in number. They are termed the Malleus (or hammer); the Incus (or anvil); and the Stapes (or stirrup); and are so named from their resemblance to these implements. The malleus consists of a body, neck, and long handle (manubrium); the latter is attached to the drum-head, and is connected with a regulating muscle, the tensor tympani. The body of the malleus fits into a corresponding cavity of the second bone (incus). The incus is shaped like a molar tooth, and consists of a body and two processes; the body articulates with the malleus, and one of the processes with the third bone (stapes); both the malleus and incus being suspended from the roof of the cavity by delicate ligaments. The incus is smaller than the malleus, and oscillates with it. The stapes which is the smallest bone in the human body, is rather less than $\frac{1}{8}$ of an inch in length; its head articulates with the incus, and its foot-plate is fixed into the fenestra ovalis by an annular ligament, and like the malleus it is regulated by a muscle, the stapedius. Thus the connection between the external ear and drum-head, with the labyrinth (internal ear), is complete. The auditory bones are developed at a very early period—the third embryonal month; being then cartilaginous, and beginning ossification between the third and fourth months. The nerve supply is derived from the *chorda tympani*, which enters the tympanum just behind the drum-head, passing across it, between the handle of the malleus and the incus, and passing out in front of the drum-head The tympanic cavity contains air which is supplied to it by the Eustachian tube, which extends from the cavity to the upper and back part of the throat called the pharynx, and situated above the soft palate, and a little above the floor of the nasal passage. This tube is nearly 1½ inches in length, and is composed of bone, cartilage, and fibrous tissue, lined with a mucous membrane continuous from the nose and throat, to the ear. It varies in calibre along its course, being widest at its pharyngeal orifice, which is large enough to admit a quill, and narrowest at the junction of the osseous with the cartilaginous portion (the isthmus). The tube is essentially a ventilation tube, its function being to supply air to the cavity of the tympanum. It is not continually open, but during swallowing, yawning and certain other movements, the pharyngeal entrance is dilated by the action of certain muscles, sufficiently to admit the ingress of air, and the egress of secretion, the membrane lining the tube so working as to remove secretion from the ear to the nose and throat.

This patent condition of the tube is essential to good hearing, as by its action the supply of air causes an equal density on both sides of the drum-head, by which the cavity becomes an air-chamber, and the ossicles are placed *in equilibrio*, and enabled to act with freedom. Closure of the tube causes the cavity to become exhausted of air—a vacuum ensues, the drum-head with the ossicles is pushed inwards, and pressure on the entrance to the internal ear (fenestra ovalis) will set up vertigo, and tinnitus, with more or less deafness; consequently, the importance of maintaining a healthy condition of the nose and throat, communicating as they do with the ear through this tube, can hardly be overestimated.

The mastoid process is a portion of the temporal bone, containing air-cells, varying in size in different individuals. The rounded prominence behind the auricle is the part now referred to. This space is connected with the upper and back part of the tympanic cavity through a large cell termed the antrum. The mucous membrane lining the mastoid process is continuous with the antrum, and the tympanic cavity, which renders the mastoid cells liable to the same inflammatory processes as the cavity. Where a discharge with perforation of the upper portion of the drum-head exists, it will be found much less amenable to treatment, owing to the antrum being involved, and the removal of secretion more difficult. The mastoid cells frequently become sclerosed or indurated, especially in old subjects, and are thus converted into a dense bony mass, of the consistence of ivory, and incapable of their function, which is to add depth, capacity, and resonance to the tympanum in receiving sound, acting as a sort of air-reservoir to the cavity. This is a simplified description of the External and Middle Ear, and its perusal will materially assist in the comprehension of its various disordered conditions.

CHAPTER II.

THE INTERNAL EAR.

The perceptive apparatus of the organ of hearing consists in: 1. The Internal Ear with nerve-terminations; 2. The Auditory nerve; 3. The Auditory nerve-centre in the brain.

A simple idea of the labyrinth (so called from the complexity of its shape) is got from the arrangement found in the lowest fishes, in which there is neither middle nor external ear. The organ of hearing consists, in these creatures, of a simple membranous bag filled with fluid and lined with cells, which receive the terminal fibres of the auditory nerve. These cells have small hair-like processes projecting into fluid. The sonorous vibrations communicated by the water to the firm parts of the head, are propagated to the fluid in tho bag, where they impinge upon the minute hair-like processes. The terminations of the auditory nerve aro thus stimulated, the stimuli are flashed along the nerve to the brain, and the sensation of hearing is experienced.

Instead of this simple apparatus, we have in man a complicated arrangement of membranous sacs, canals, and tubes, forming the membranous labyrinth in the vestibule semicircular canals and cochlea; these parts being hollowed out of the petrous bono, and contained in an unyielding casing—the osseous labyrinth. These spaces are filled with a watery fluid, which is a part of the water of the brain, and in which are suspended the membranous structures. There are three distinct divisions. The Vestibule in the centre; the semicircular canals behind; the cochlea in front.

The *vestibule* communicates with the middle ear, or drum-cavity, through the *fenestra ovalis*, closed by the base of the stapes, and situated in the inner wall of the tympanum. From one side of this central cavity there spring three canals—*the semicircular canals*, and on the opposite side there opens into the vestibule a spiral tube, which, from its resemblance to a snail-shell is termed the *Cochlea.* The membrane covering the *fenestra rotunda*, separating the interior of the cochlea from the drum-cavity. Thus, like the outer and middle ear, the inner ear is divided into three parts. The inner aspect of the osseous wall of the vestibule and the base of the cochlea, are pierced with a number of holes, through which pass the fibres of the auditory nerve from the *internal* auditory canal to the membranous structures.

The membranous *semicircular canals* are three in number, encased in their osseous shells, and are about $\frac{1}{20}$ of an inch in diameter, and placed at right angles to each other; one being horizontal, one vertical, and the third having its axis from back to front. The superior and posterior canals enter the vestibule by a common orifice, so making five openings into the vestibule instead of six; and at each end of the canals there is an enlargement called the *ampulla*, each ampulla communicating with the *utricle.* The vestibular portion of the membranous labyrinth is composed of two parts, the *utricle* and *saccule*, communicating indirectly with each other by the *aqueductus vestibuli.* Where the utricle adheres to the walls of the vestibule, occurs a thickening, (*macula acustica*), the cells terminating in fine stiff hairs, and being modified for the reception of nerves. It is here the otoliths (carbonate of lime crystals) are found; and on the inner surface of each ampullated canal, as it is attached to the bone, a similar structure is found (*crista acustica*), also modified for the reception of nerves.

The utricle and semicircular canals form the posterior labyrinth, devoted to the sense of motion and equilibration; and regarded as a whole, the posterior labyrinth forms three complete circles, as the utricle unites each end of the semicircular canals.

The saccule is of oval form and about $\frac{1}{15}$ of an inch in diameter, and similar to the utricle in structure. It also presents a similar *macula acustica*. It is loosely adherent to the bone by fibrous and nerve filaments, and floats in the perilymph, and it communicates with the membranous labyrinth of the cochlea by a small duct (*ductus reuniens*) and is more immediately concerned with the function of hearing.

Thus, the membranous labyrinth constitutes an irregular cavity filled with endolymph, and surrounded with perilymph.

The cochlea is the most anterior part of the labyrinth. Of a conical shape, its base is towards the end of the internal auditory canal, and its apex towards the osseous part of the Eustachian tube. From the base to the apex extends a pyramidal pillar, called the *modiolus*, which is pierced in the direction of its long axis by canals conveying the fibres of the auditory nerve destined for the cochlea, as well as the small blood-vessels.

The space between the outer wall of the cochlea and this central part, is divided into two winding passages (*scalæ*), lying over one another, by a partition which winds in a spiral direction from base to apex, and extends between the central pillar and outer wall, being partly bone and partly membrane. The bony part springs from the central pillar, and reaches half across the interval, and the membranous part completes the outer half. This membranous part being really a triangular space (*scala media*), and containing complicated and important structures, bounded above and below by membrane. This partition begins between the *fenestra ovalis* and *fenestra rotunda*, and takes two and a half turns round the modiolus, diminishing and terminating towards the apex. Of the two winding passages formed in this way, the upper is called the *scala* *vestibuli*, as it opens into the vestibule; and the lower, the *scala tympani*, because it passes into the tympanic cavity at the fenestra rotunda, being separated from the tympanum by a thin membrane, which closes the opening. The two *scalæ* open into each other at the apex by a small aperture called *the helicotrema.*

A membrane composed of connective tissue lines the osseous surfaces of the interior of the labyrinth, and this membrane secretes a thin fluid termed the *perilymph*, which fills the two *scalæ*, and occupies the space between the walls of the osseous labyrinth, and the membranous tubes and sacs contained in the vestibule, and semicircular canals, and this perilymph is in communication with the arachnoid space through the *aqueductus cochleæ.*

In the membranous canal, and regarded as the most essential part of the terminal apparatus of the auditory nerve, is situated the *Organ of Corti.* This canal lies between the scala vestibuli and the scala tympani, with a thin partition between the canal and the scala vestibuli, termed *Reissner's membrane*, which passes from the upper margin of the bony spiral lamina to the outer wall of the cochlea, while the partition between the membranous canal and the scala tympani is termed the *basilar membrane.* The organ of Corti lies on the surface of this membrane between the two scalæ, inside the canal, and immersed in the endolymph. It consists of a supporting framework, of two pillars leaning towards each other and uniting above, forming what is called Corti's arch. This arch supports a delicate net work, in the meshes of which are a series of peculiarly modified cells both inside and outside the arch. The cells are clothed with stiff cilia, or very fine hairs on the upper ends, projecting into the endolymph, and to these cells the nerve filaments pass. It having been shown that Corti's cells are in connection with the ends of the fibres of the cochlear nerve, which, branching from the nerves passing through the central pillar of the cochlea, reach Corti's cells by delicate cross canals in the osseous spiral lamina. The rods and cilia lengthen with the general widening of the Organ of Corti, from base to apex of the cochlea. There are more than 3000 of these rods in the human ear, each one being specially tuned for the reception and interpretation of the most minute degree of sound in the musical scale.

The Auditory nerve has its origin at the back part of the *medulla oblongata.* The roots being connected with the grey matter of the cerebellum, and other parts. According to Ferrier the auditory centre is situated in the temporal lobe of the cerebrum of the opposite side, destruction of this superior temporal convolution causing total loss of hearing power on the reverse side. The auditory nerve is the *portio mollis* of the seventh cranial, and as its name implies, is soft and destitute of neurilemma, and liable to injury. It enters the internal meatus, in company with the facial nerve, from which it is divided by a small artery, and is divided into two branches. The anterior branch supplies the cochlea, passing up the modiolus, through a ganglion, terminating in the organ of Corti; the posterior dividing into five branches, distributed to the *maculæ acusticæ,* and the three *cristæ acusticæ.*

Having now considered the auditory apparatus as a whole, we are in a position to study its functions, and the physiology of sound.

CHAPTER III.

FUNCTIONS OF THE EAR AND PHYSIOLOGY OF SOUND.

Hearing consists in a wave of sound being directed into the auditory canal, and striking against the tense drum-head. The drum-head imparts an impetus to the chain of ear-bones (ossicles) with which (as we have seen), it is in close relationship. The ossicles oscillate, carrying on the sound-wave to the stapes, which in turn acts on the opening to the vestibule (fenestra ovalis) with a piston-like movement (which in the production of very high notes, may exceed 40,000 per second), causing a pressure on the fluid of the labyrinth, affecting the organ of Corti, exciting the nerve terminations, and being carried along the auditory nerve, to the nerve centre in the brain.

The sense of hearing depends upon a disturbance in the fluids of the internal ear, causing excitation of the auditory nerve-fibres, by a certain effect on the otoliths, or ear crystals.

Very loud sounds may be distinguished without the assistance of the drum-head and the first two ossicles, because the sound wave will pass direct to the 3rd bone (stapes) and thus reach the labyrinth to some extent, but if the 3rd bone become fixed, or destroyed, or so disorganised as to allow of the escape of the fluid of the labyrinth, complete and hopeless deafness will result. The minute wavelets set in motion by the oscillation of the stapes, stream through the passages of the labyrinth, pressure impinges upon the terminal structures of the auditory nerve, a change is produced in the nerve affecting the brain centre, and purely physical phenomena are transformed into that sensation called sound. An inward movement of the stapes on the fenestra ovalis produces an outward movement of the fenestra rotunda by displacement of fluid, and therefore the special function of the second fenestra is to act as a safety valve to excessive pressure on the fluid of the labyrinth. It is when the membrane of the fenestra rotunda becomes rigid from catarrhal processes in the middle ear that pressure affects the auditory nerve by giddiness and noises in the ear.

The proper perception of sound is effected by a division of labour among the various parts of the internal ear—thus the vestibule is specially intended for the reception of sound in general, and is the most essential part of the internal ear. The semicircular canals were, at one time, considered necessary to teach us the direction of sounds, but this has since been proved to be wrong—the direction of sound is ascertained by comparing its intensity with the two ears, so that a person deaf in one ear will never be able to distinguish the originating point of sound, although the semicircular canals be normal. Their function is undoubtedly that of equilibration. They are the "static organ" of the body, and have little to do with the hearing power. Irritation, or injury to the semi-circular canals produces giddiness and nausea, all the effects of sea-sickness in fact, and these effects are the result of irritation of those canals. Each semicircular canal with the utricle forms a complete circle, and at one point of the circle is a crest covered with nerve terminations, the whole being filled with fluid. Tho canals being at right angles one with another, it follows that when the body is turned in the axis of this circle, the fluid tending to remain stationary, the effect of a current in the opposite direction will result. This current impinges on the crista acustica, exciting the nerve terminations, and producing the sensation.

The cochlea is the most highly developed part of the labyrinth. The cochlear nerve in connection with Corti's cells having for its special function the recognition and analysis of musical tones. Thus in hearing a musical chord, the vestibule informs us of the sound, and the cochlea discriminates the various tones. Let us now pass on to the physiology of sound. What is a sound-wave? It is atmospheric motion imparted by undulations of the air. A shock from a sounding body communicates a wave of undulation all around it, just as when a stone is thrown into water, the water ripples in circular undulations all round the spot where the stone sank. The sound wave passes to tho drum-head with the effect already described.

Sound waves travel at the rate of 1,100 feet per second at freezing point, the velocity increasing 2 feet for each 2° C., and intensity of sound depends on the breadth of these waves; pitch depending on their number per second. Thus, a very high shrill sound is caused by the greater number of vibrations per second, while low or grave sounds are determined by the fewness of these vibrations in a given time. The healthy human ear best hears sounds that are produced by about 3000 vibrations in a second, but the ear is capable of distinguishing vibrations as low as 16 per second, and as high as 35,000 per second; vibrations of higher pitch not being heard at all. Skilled musicians are able, in some cases, to distinguish the difference between two notes as minute as 1.64th of a semi-tone, due to the state of perfection to which the cochlea and Corti's organ have been brought by cultivation and natural tendency.

Although most people are able to distinguish eight or nine octaves, there are some who cannot hear very high or low notes. For instance, the chirp of the cricket is inaudible to some, and this peculiarity shews that audition is a relative faculty apart from aural disease, for it has been found that partially deaf people are capable of a finer perception of musical sounds than many with normal hearing.

There is nothing in the constitution of the atmosphere to prevent the existence of vibrations incomparably more frequent than any of which we are conscious, and the hearing of some animals and insects appears to commence where ours terminates, so that they may be considered to possess another sense agreeing with our own only in the medium by which it is excited.

Deaf people hear high, sharp sounds better than low ones, as a rule, even when the nervous apparatus of hearing be affected, and the inability to hear such sharp sounds points to disease of the labyrinth, with few exceptions. Sound is not perceptible for more than a very short time after the cause has ceased to operate, because the drum-head is hampered by the handle of the malleus; and when tense, the drum-head responds best to high sounds, and when relaxed, to sounds of low pitch.

When sound waves occur with regular and even intervals the result is harmonious and musical; when irregular in duration, strength, or time of emission, discord is the result.

Echo is the return of the sound-waves to their source.

CHAPTER IV.

THE EAR IN HEALTH.

The prevention of Aural Disease, and the preservation of the sense of Hearing, may well engage the attention of the highest as the lowest; capable as is this faculty of conveying the most unbounded pleasure, yet so little is the ear and its functions understood, that it is subjected to the most barbarous treatment, even by educated people—such treatment as never would be inflicted on the sister organ—the eye. It is not always possible to discover whether the ear is in a healthy condition, but it is desirable and important to be aware of the first approaches of disease; so the following observations on the natural condition and functions of the organ of hearing cannot be out of place.

The sense of hearing is double—like the sight, each communicating a precisely similar sensation, so that if deafness attack both ears in equal proportion, the power of hearing may be greatly impaired before the individual is aware of his infirmity. Usually, however, an ear defect is quickly discovered if one ear alone become affected, because there will be an inability to distinguish the direction of sounds, although it may be stated that few people hear equally well with both ears, just as few see with equal facility with both eyes. When in advanced age, the hearing power becomes gradually lowered, so imperceptibly does the defect increase, that a patient's friends are more often the first to discover it, the sufferer being unconscious of his defect till told of it, and even then, will resent and deny its existence; and a somewhat similar difficulty exists with regard to young children, their infirmity being taken for stupidity or inattention. This being so, it will be seen how important for a child's future, is the necessity for testing the hearing in slow and inattentive children, because the chance of cure will depend in a very great measure on the disorder being treated at an early stage.

The hearing power of even a healthy ear will vary in the same individual at different ages, and under the influence of the physical and mental condition; but, broadly speaking, a normal ear will hear an ordinary watch from four to six feet in perfect quietness. Many circumstances tend to vary the hearing power in different healthy individuals; such as the form of the auricle, the ceruminous secretion, length and curve of the canal, quantity of hair at its entrance, natural thickness of the drum-head, and the degree of sensitiveness and impressibility of the nervous system. The latter especially accounting for the obtuseness of hearing so common in the lower class country people; the ear suffering from want of culture and attention; for no one can doubt that even a healthy ear, as the other senses, may be rendered still more acute by attention and practice. The power of distinguishing musical sounds to a nicety is mostly a natural gift, the acoustic expansion in the vestibule and in the ampullæ perceiving irregular vibrations, and Corti's fibres in the cochlea being designed for the perception of musical tones. The tuning of the latter corresponding to the regular gradation of the musical scale; therefore, the perception of different sounds is a sensation of different nerve filaments, corresponding to the ability to distinguish minute variations of colour; hence, a partially deaf person may be a more correct judge of musical tones than one with normal hearing; just as certain people with keen eye-sight fail to detect certain colours, and are, as it is termed, "colour-blind". An ear for music, is, in most individuals, a natural gift, traceable in families and nations.

That a great part of deafness proceeds from inattention cannot be denied:—

Fal. "Very well, my lord, very well; rather an 't please you, it is the disease of not listening, the malady of not marking, that I am troubled withal." (*King Henry IV.*)

There is no means of rendering even healthy ears proof against deafness; no specific preventive of the complaint, beyond the care of the general health, and a prompt attention to the slightest deviation from normal hearing, together with due precautions where, as undoubtedly may be the case, an hereditary tendency exists. It must never be forgotten, too, that the faculty of hearing, like other physical powers of the human frame, is capable of the highest development, and protracted vigour, under diligent cultivation: and subject to decay and decrepitude as the penalty of neglect. Of the lost senses, deafness is the greater affliction. Shut out from social life, the deaf early become melancholy and listless; the blind being invariably cheerful and happy. The hearing contributes more effectually to the everyday happiness of life, enabling one to hold communion with one's fellow-creatures; to improve and exalt the understanding by mutual interchange of ideas, and to increase the circle, not only of our physical, but of our moral relations. The charms of eloquence, the pleasure resulting from the concord of sweet sounds, inexplicable perhaps, as it remains, are other sources of intellectual enjoyment, which contribute to place this sense among the most delightful as well as the most important we possess; and whoever has witnessed the distressing effect arising from a loss or diminution of hearing power, will acknowledge the distance that separates the sufferer from his kind; and whatever, therefore, that by explaining its structure and functions, can lead us to improvo the organ of hearing, can never be considered a subject of trivial moment.

CHAPTER V.

CAUSES OF EAR-DISEASE.

A GENERAL review of pre-disposing, or exciting causes of ear-disease, giving rise to morbid conditions of the organ, deserves particular attention.

HEREDITY. This is undoubtedly a strong factor in the causation of all forms of ear-disease, but more especially of morbid changes usually designated chronic adhesive catarrh of the middle ear. Congenital malformations of the inner ear frequently found in connection with deaf-mutism, are also, doubtless, the effects of hereditary tendencies. Hereditary pre-disposition is sometimes found very marked, where almost every member of a family has some form of ear-disease; but it may be observed that children are not necessarily affected with the same form of ear-disease as the parent. The father may have chronic adhesive catarrh of the middle ear; the children purulent inflammation. It will be found, too, that the hereditary tendency is not always direct, but may descend from collateral relatives, as uncles or great-uncles. Politzer states that the hereditary influence is greater in the second generation than in the immediate offspring. We must remember that ear-disease is very common, and even if it be ascertained that some relative has impaired hearing, we are not justified in concluding that hereditary taint exists in all such cases. The hereditary tendency may consist in the peculiar formation of certain parts of the ear, such as the recesses leading to the fenestral membranes, favouring the detention and organization of catarrhal products; but probably the "catarrhal tendency" is of more signification, manifesting a special liability to nasal and pharyngeal catarrhs. A peculiar shape of the inner ear favouring deafness may be inherited, just as much as the shape of the skull, or the shape of the nose.

Age. The peculiarities of different ages cannot be excluded from the production of ear-disease. Especially is this the case in childhood, when exudative disease of the middle ear, particularly of a purulent character, is very frequent, as compared to adult age. This partly arises from the prevalence of exanthematous disease, and partly from certain peculiarities of structure existing in children—such as the smallness of the naso-pharyngeal space; the thickness of the membrane lining the Eustachian tubes, and the narrowness of its pharyngeal orifice. Adenoid vegetations in children also favour ear-disease; and the rapid growth of mucous membrane in the middle ear, which takes place soon after birth, also favours congestion in this part.

In adult and advanced life, on the contrary, chronic adhesive, or dry catarrh of the middle ear is more frequent. The ventilation of the ear is interfered with in old age by the flaccid state of the Eustachian walls and the feeble power of the tube muscles.

Position in Life; Habits, &c. Occupation, habits, and general surroundings, have considerable influence over ear-disease—its causation and continuance. The poor are exposed to all kinds of weather; cold, damp, ill-ventilated dwellings, insufficient nourishment, and scanty clothing. All these, subject the lower classes to inflammatory ear affections, more or less persistent. The children of the poor are especially liable to ear-disease. Workmen exposed to loud, continuous, and sudden noises—such as boilermakers, riveters and railway servants generally, are especially liable to disease of the labyrinth (nerve-deafness). Again, those engaged in work in the midst of air loaded with dust and dirt, or in badly ventilated places, are very prone to ear-disease; such circumstances being especially injurious if a predisposition, hereditary or otherwise, should exist in the individual. Alcohol and tobacco immoderately used, may not only induce ear affections directly, where any pre-disposition exists, but will influence the hearing by affecting the pharyngeal mucous membrane, and setting up a condition of chronic-catarrh which is very sure though slow in its effects on the middle ear.

General Diseases, or Morbid Changes involving the Circulation. Strumous, tubercular, and syphilitic taints, not only greatly predispose to ear-disease, but impress upon these diseases a specifically unfavourable tendency. Strumous constitutions will cause a passing attack of acute inflammation to take a suppurative form attended with serious complications, and becoming chronic and persistent. At the same time, too much attention to a strumous diathesis, and neglect of local treatment will prove ineffective. But there is no doubt that strumous individuals, especially children, will have greater trouble in curing or even arresting an ear-affection.

In tubercular people, suppurative ear-disease is not merely common. but attended with complications such as destructive softening of the middle ear membrane; and other forms of ear-disease will take unfavourable courses which are unlikely in healthy constitutions.

Syphilis affects the ear in various ways: ulceration of the cutaneous lining of the ear may be due to it; or, the secondary stage may cause mucous catarrh of the middle ear. Chronic catarrh of the middle ear, involving the labyrinth, may occur, with rapid and serious loss of hearing. Labyrinthine disease, gradual or sudden, on one or both sides, with complete loss of hearing, associated with keratitis or iritis, may be seen in children with hereditary syphilis.

Zymotic Diseases will cause ear-disease, acting through the continuity of the skin and mucous membrane, and these diseases may also cause important changes in the ear, especially the labyrinth, acting through the circulation and setting up permanent deafness. Typhus, and typhoid fever affect the labyrinth by causing hyperæmia of this part; and intermittent fever may also act in the same way.

Bright's Disease, Gout, Rheumatism, and Anæmia, may all cause deafness; acting through the circulation or the nervous system, and the common and easily-recognized complaint—mumps, may affect the hearing by producing some change in the labyrinth. Pregnancy, hysteria, suckling, and puerperal fever are frequently the cause of deafness, or will aggravate a pre-existing ear-disorder.

Organic disease of the heart and lungs or of the large vessels may cause deafness by causing venous stasis of the head circulation, or by producing excessive arterial tension, thus setting up hyperæmia of the nose, throat and ear, by causing tissue changes in these parts.

Quinine, salicine, opium, and alcohol may all cause deafness and tinnitus, if taken for prolonged periods, by affecting the labyrinth, and naturally they affect the organ of hearing more quickly in people predisposed to aural troubles; even small doses, in such cases, proving a great aggravation of both deafness and tinnitus, especially the latter.

Disease of Adjacent Parts. There is no more predisposing cause of deafness than disease of the neighbouring parts, as the nose and throat. The majority of cases of middle-ear disease are set up by extension through the pharyngeal entrance to the ear; not only do nasal catarrhs and pharyngitis affect the ear very seriously, but bronchitis, influenza, and pneumonia, may also excite morbid conditions leading to intense deafness. The mere act of coughing may unduly condense the air in the tympanic cavity, and disorganise its contents. It is mostly through the nose and throat that scarlet fever and measles attack the ear, extending from these parts along the Eustachian tube. The most obstinate and destructive cases of purulent catarrh arise from scarlet fever in this way, destroying the drum-head and part of the contents of the middle-ear, and setting up intense and incurable deafness. Diphtheria may also affect the ear in the same way, in addition to paralyzing the muscles of the palate and Eustachian tube.

Erythema, erysipelas or eczema affecting the head or face may easily extend to the auricle and to the auditory canal, and unless promptly treated may still further extend to the drum-head and middle ear, acting through the continuity of the skin.

Morbid intra-cranial conditions may affect the auditory nerve and labyrinth. Anæmia of the labyrinth may occur, or hæmorrhage into the labyrinth; obstruction to the venous blood from the labyrinth into the sinuses of the brain may lead to passive congestion. Apoplectic clots, inflammation of the brain, or the meninges, tumours, abscesses, may all damage the root, stem, or expansion of the auditory nerve; and through diseased changes in the arachnoid space may be extended to the interior of the labyrinth.

Pre-existing Ear-Disease. A previous or a present attack of ear-disease will predispose to a return of the same, or another form. It is unfortunately only too certain, that one attack is apt to establish a tendency to future attack, and each return will increase the tendency. Especially does this apply to catarrhal and inflammatory conditions of mucous membranes; and by virtue of the great sympathy existing between all mucous membranes, disease of one part may rapidly spread to another, if neglected. It is when a chronic condition of the middle ear is set up that secondary nerve-deafness is provoked, which will defy the most discriminating treatment, owing to pathological changes in the labyrinth; hence the importance of prompt attention to even a slight attack of ear, nose and throat disease.

Neglect of Treatment. This is an important element in the perpetuation of all forms of ear-disease. Acute attacks develop chronic conditions, mainly owing to neglect, or improper treatment. Thus a slight obstruction of the Eustachian tube, easily remediable if taken in time, may pass to the middle ear, and set up pronounced and permanent deafness, by its action on the tympanic membrane, and the contents of the tympanum generally. The most frequent form of ear-disease which is perpetuated by neglect is Otorrhœa, *i.e.*, an ear-discharge. The first and most important thing being cleanliness, by constant syringing; not merely the auditory canal requires cleansing, but the middle ear, where the discharge accumulates and is retained, and unless removed will set up renewed inflammation by decomposing.

Reflex Causes. As described by Dr. Woakes, morbid impressions may be transmitted to the ear in a reflex way, acting through the vaso-motor nerves from different parts of the body. The action of cold feet in exciting ear-mischief is a typical example of reflex influence. The production of ear-ache and ear-discharges in children by the teething process, or by carious teeth in adults, is another example; in this case, the dental nerves through their connection with the middle and external ear, by Otic and Meckel's ganglia, transmit the irritation from the teeth to the ear. Indigestion may also exercise sympathetic hyperæmia of the ear, arising from reflex sympathy with the digestive organs; and also in females, with the procreative organs.

THE ACTION OF COLD. The ear is remarkably intolerant of cold, and a very large number of cases are set up by this cause. Apart from the action of cold on the nose and throat, the ear may be directly acted upon by exposure to inclement weather, to cold water trickling into the ear in bathing, or washing the head, and to the action of draughts of cold air. Those persons having a strong predisposition to ear-disease, of course, feel the effects of cold and exposure more quickly and decidedly than those with a normal condition of the organ of hearing, consequently it is necessary they should take the greater care to avoid such causes.

INJURIES. A large number of ear-diseases originate in injuries caused by direct violence, mischievous interference with the ear, or by improper treatment. Inspissated cerumen, furuncles and diffuse inflammation may result from irritating the sides of the auditory canal by attempts to remove wax, or foreign bodies from the ear; and by efforts to relieve itching, by the introduction of sharp pointed instruments. The delicate cutaneous lining of the canal will not tolerate manual interference, and even the screwed up corner of a towel, or the introduction of "aurilaves," set up ear trouble. Unskilful and violent syringing, or the use of irritating liquids, likewise injure the ear. Even oils may prove hurtful, unless mixed with an antiseptic, by turning rancid in the canal, and setting up inflammation, and encouraging fungi and minute organisms. Pure glycerine is also dangerous, for by its affinity for water, it partakes of the nature of a caustic, and so increases the trouble. It should be mixed with water. Piercing the lobe (now happily dying out) for ear-rings, sometimes gives rise to eczema, which may spread to the inner ear. Blows upon the ear, or striking the water sideways in diving, may rupture the drum, and injure the internal ear. Concussion of the head, by falls, etc., may injure the osseous walls of the ear, and cause effusion of blood into the middle and internal ears. Efforts to extract foreign bodies may cause injury, even to the deeper ear-structures. Abuse of the Valsalvan method of inflation, may, by rendering the drum-head flaccid, cause lasting injury and impairment of hearing power. Sudden and loud noises, as the firing of cannon, or the piercing shriek of a railway whistle, may also cause ear-disease, although, strange to say, such injurious effects are not so pronounced if the noises are expected and the mouth opened. Constant loud noises, as of machinery, exercise an injurious effect on the internal ear, or labyrinth, which will slowly but surely increase unless the cause be discontinued. "Boxes on the ear" act by condensing the air in the auditory canal and rupturing the drum, or acting on the internal ear by concussion; such a punishment should never be practised by those in charge of children, for be it remembered, there is a part of our anatomy evidently intended by nature for punishment. Many cases of confirmed deafness may be dated from the brutal habit of striking children on the ears, and those in charge of them should have their attention directed to the probable consequences of such violence.

Lastly, injury to the ear may arise without any assignable cause, and will require great patience and discernment to treat with good effect. The pathology of deafness and of other organs connected directly or remotely with the economy of hearing, has in past years been veiled in great obscurity, and the student has been almost destitute of information concerning the morbid changes of this beautiful mechanism, and it is needless to insist upon the necessity of careful discrimination in the study of an infirmity depending upon so great a variety of causes and conditions of the frame.

CHAPTER VI.

WHAT NOT TO DO.

Never pick or probe the ear, nor syringe it violently, nor use very hot or very cold water. Never syringe at all except for the purpose of removing discharges, foreign bodies, or inspissated cerumen, and then never use soap. Never drop in oil unless mixed with glycerine or other antiseptic.

Never plug up the ear with cotton wool, unless there be a discharge, or a strong draught. The auricle may be frozen before the middle ear will suffer from cold, except strong blasts or draughts of cold air, when the cold is, of course, forced into the ear. Wool continually worn in the ears is about as absurd as wool inserted in the nostrils. The auditory canal becomes hyper-heated, and rendered unhealthy and relaxed, and a single omission to insert the wool when going out may set up ear-disease. If wool has been worn some time, it must be discontinued gradually, and better in summer than winter.

Especially is the habit of packing the ear with wool, a reprehensible one with children, secretion being retained in the ear, and decomposing, and setting up renewed inflammation. If necessary to wear wool at all, it should be a loosely drawn-out piece, and tight packing avoided.

Never dive, particularly in the sea, without protecting the ears, by inserting a piece of wool dipped in oil. No water will, under ordinary circumstances, pass this; and it should be taken out directly after bathing. Sea-water, from its peculiar composition, is extremely irritant to sensitive parts, and will prove highly inflammatory to pre-existing ear-disease. Never insert quack nostrums, pieces of bacon, the heart of an onion, hot oils, or eau-de-cologne, in the ears, they cannot do more good than a little warm water, and may be most mischievous in effect; such cases sometimes go beyond all skill and remedial treatment.

Never place poultices *over* the ear, but *round* it. They may bring on a discharge, and permanently injure the drum-head. Pain will be more easily allayed by dry heat, such as a hot dry flannel; and the ear filled with a warm anodyne. If a poultico is absolutely necessary, place it round or under the ear.

Never pull or box children's ears, for, as already described, permanent injury may result.

Never withdraw from society or social intercourse, on account of partial deafness. The hearing, like the other senses, requires use, and is subject to still further decay by neglect, and a slight deafness will become more pronounced by a lonely life; and the idea that it is a social duty of the deaf to avoid society may be ignored.

Avoid as much as possible the habit of sleeping with the mouth open. If there be nasal obstruction it will be increased by this habit; but attempts to force the air in and out of the nostrils will break down obstructions. Oral-breathing is a habit which will not only aggravate impaired hearing, but induce it, and it will also irritate the larynx, and the bronchial tubes, setting up disease in these parts.

Avoid wet feet, damp bed-clothes, sudden changes of temperature, plethora, constipation, exposure, excessive mental and physical fatigue; and study everything contributing to the *mens sana in corpore sano.*

The necessity for shunning those causes which tend to injuriously affect the mechanism of the auditory apparatus, and to lessen the efficiency of the auditory nerve by secondary processes and reflex action, must not be overlooked. A most essential precaution in avoidance of deafness, is to run no risk of "catching a cold". Carelessness in the first instance and neglect of the early symptoms, such as sore throat, ear-ache, and tinnitus, will leave their mark on the hearing power. A succession of slight colds in the head will prove more injurious than one severe cold, because the tendency to chronic catarrh and consequent thickening of the mucous membrane lining the throat, and extending through the Eustachian tube to the middle ear, will become more pronounced, and obstinate to the most discerning treatment. What does catching a "cold" really mean? It means a loss of heat. The body having been subjected to the action of cold, the immediate effect is an excessive expansion of the small vessels supplying the nose and throat, causing the blood within them to flow slowly or stagnate, and the mucous membrane becomes congested and swollen, with increased secretion, thence extending to the middle ear.

The extent of this nervous action depends on the vital forces of the individual. Those with a high degree of vitality suffer very little from a "cold"; others whose systems have been weakened by excess, illness, or age, lack sufficient power to restore the nervous energy, and throw off the depressing effects of the strain on the system. The most common cause of deafness is catarrh, and the following table will give the reader some idea of the danger of cold catching as predisposing to aural disease.

Catarrh	1000	56 %
Scarlet fever	460	26 %
Measles	92	5 %
Small pox	4	
General eruptive diseases	18	
Disease of the ear	10	
" of throat and lungs	38	
Scrofula and Rickets	32	
Glandular disease	111	6 %

It will be noted how comparatively rare is disease of the ear, pure and simple; and we must remember, although scarlet fever deafness is less than half the number of catarrhal cases, still it is quite as formidable, for the reason that scarlet fever is usually so destructive to the organ of hearing, that cure or mitigation is out of all possibility, while judicious treatment may improve if not completely master catarrhal deafness, depending upon what stage treatment is tried; for the old saying "a stitch in time" applies with greater force to aural disease than any other. Give a catarrhal process time and opportunity to organise itself, and the condition will become chronic and lasting. Those people who are so prone to probe and otherwise interfere with their ears, should remember the old adage and apply it to the ear: "You should never touch your eye but with your elbow".

"Drops for the ear" are largely resorted to by the poor and ignorant, and the charlatan makes a fortune, indifferent to the evil he works. The majority of the causes of deafness originate on the inner side of the drum-head, consequently the sodden condition to which the auditory canal and drum-head are reduced by "drops," increases the irritation, which may eventuate in fatal inflammation. This applies also to that apparently harmless remedy "sweet oil," so dear to the hearts of a number of us—"dear" in a double senso!

CHAPTER VII.

DIAGNOSIS.

In treating deafness, it is necessary to obtain as accurate a history of the case as possible, and to examine the ear, throat and nostrils, and the Eustachian tube by inflation. The middle and internal ears are, of course, hidden from view, but by means of subjective and objective methods of examination, a fairly reliable diagnosis may be obtained. It is as well, however, to remember, that it would not suffice if anatomy were able to develop every morbid alteration of structure of which the ear is susceptible. A great object would indeed be attained, but a greater would still be unaccomplished—the cure of such morbid conditions, particularly of the internal ear—or the nervous apparatus of the organ. There can be no doubt that sound constitutional treatment is as indispensable as local treatment, and a searching and systematic investigation into the general health, and the treatment of any latent disorder of the system equally important. One ear is less often affected alone, and local treatment applied to the one will sometimes prove beneficial to the other, and less affected ear. In diagnosing the causes of impaired hearing it is important to know:—

1st. How long the deafness has existed. The cause or probable cause, or, failing that, under what circumstances did the deafness arise. Next, the past and present state of health, temperament, constitution, age, sex, and general mode of life.

2nd. The Ear must be examined. The condition of the auricle should be noted, whether there is, or has been, any cutaneous disease. The parts all round the auricle should be gently pressed with the finger to ascertain if any painful sensation arise. If pain is caused by pressure on the tragus, inflammation of the auditory canal is indicated; tenderness on pressure beneath the lobe, denotes middle-ear disease; and if the mastoid be painful, disease of that part proceeding either from the auditory canal, or middle-ear, exists. Disease of all these parts may exist without any pain on pressure, consequently the existence or absence of pain has to be considered relatively.

3rd. The auditory canal should be inspected. This may be done fairly well with the aid of artificial light, such as a bull's eye lamp, and drawing the auricle slightly upwards and backwards, so as to straighten the auditory canal. At the outer or cartilaginous portion of the canal in healthy ears, will be noted a thin layer of cerumen, and a number of fine hairs, which vary in different individuals. Further down and in the osseous portion of the canal, it should present a smooth and pinkish appearance, and at the termination of this part will be seen the drum-head, presenting a tense, smooth, pearly semi-transparency, similar to a stretched piece of gold-beater's skin. The appearance of a healthy membrana tympani is very beautiful, but in disease it assumes a deadened appearance, being brownish, coppery, or slate coloured, with absence of the cone of light. Or with patches of dark colour, shewing calcareous deposits, or thickening on either the inner or outer side. To properly inspect the ear, a speculum is required, but as it requires some practice to properly insert, and may do injury in clumsy hands, the writer does not advise its use by the laity. The object of examining the auditory canal is to discover whether the passage is inflamed, as denoted by a reddish appearance, and whether there be any impacted wax, morbid secretion, or foreign body in the ear, or whether the drum-head is inflamed or perforated; or if the drum-head be entirely destroyed, when the middle ear would be partly visible, presenting a pinkish appearance from the mucous membrane lining the tympanum.

4th. It will next be necessary to examine the throat for signs of inflammation, relaxation, enlarged or ulcerated tonsils, olongated uvula, etc.; and notice taken of the voice, whether normal, nasal or weak. Now the nose must be examined: whether air passes down both nostrils, whether any soreness or obstruction exists on either side, and if such be the case, the posterior nares should be explored with a catheter for the purpose of ascertaining the presence of foreign growths or thickening of the nasal mucous membrane. Then the Eustachian tube must be tested—whether pervious, by inflation (see chapter on inflation). If the tube be pervious, a "click" or a "crack" will be heard. A rattling sound denotes effusion into the tympanic cavity, gurgling sounds denote excessive liquid secretion in the tubes; a loud rushing or blowing sound with easy inflation, denotes a sclerotic condition of the tubes, and air passing out of the ear proves perforation of the drum-head. If the tubes cannot be inflated at all, and no impression is made upon them by Valsalva's or Politzer's methods, then a state of complete obstruction exists, which will have to be overcome if the hearing is to be improved, and which will require catheterization of the ear.

Next the hearing power must be tested, as described in the next chapter.

Too much importance cannot be attached to the local symptoms, such as nasal obstruction, and throat troubles; if these parts were judiciously treated when deafness first comes on, by injections and gargles, and the Eustachian tubes kept free, the deafness would be arrested, and be merely temporary, and leave no lasting effects; but neglect in the beginning gives time for organization, and the trouble will pass to the middle ear, and set up pathological changes, defying to a great extent the most discriminating treatment.

CHAPTER VIII.

TESTING THE HEARING.

It is rather difficult for the laity to discover whether the hearing is perfect. The sense being double, the hearing power may diminish in equal proportion on each side, in which case a slight deafness may exist many years without inconvenience, and without knowledge. If one ear become deaf, the impairment may be noticed almost at once, from the inability to distinguish the direction of sounds. There is a considerable variation in the hearing power of different individuals, at different times of life. The hearing distance of a healthy ear may be from three to six feet, to the tick of a watch in a closed room, in perfect silence; the most reliable test being a comparative one. As watches vary, no definite distance can be laid down, but the hearing power of an individual with notoriously good hearing should be tested, and the same test, *i.e.*, the same watch and degree of quietude, be applied to the hearing of any person suspicious of encroachment on his hearing power. The watch, however, does not always afford a sufficient means of determining the amount of the hearing power, because the distance at which it is heard, does not always stand in proper proportion to the power of understanding conversation. Instances occur where people are able to hear low-toned conversation, yet cannot hear a watch close to the ear; or this state of things may be reversed. Broadly speaking, people deaf from childhood, hear a watch better than conversation; and people overtaken by deafness in later life, hear conversation better than a watch. This is partly explained by the fact that adults are more accustomed to conversation than children; and it also happens that people with perforated drums, using artificial drums, hear conversation well, and the watch not at all. Many people, too, imagine they hear worse by twilight, or in darkness, and think this a proof of nervous deafness, but it is merely a natural result of the fact, that such persons who suffer from deafness lose the benefit of sight to aid the hearing, whereby they watch the speaker's lips, to comprehend what was only imperfectly heard. Thus, there is a good difference between *hearing* conversation and *understanding* it.

In testing by watch, one with a clear tone should be chosen, because some watches have merely a smooth rubbing sound, and no tone at all, and are therefore ill-adapted for the purpose. Having tested the hearing distance of a healthy ear, the watch should be held beyond the hearing distance of the patient, then gradually brought closer to the ear till the sound is appreciated; by this means self-deception is avoided. In very bad cases a watch is useless, then a loudly ticking clock should be used.

Children and obtuse persons sometimes say the watch is heard when it is not, and for such, a "stop" watch is useful. There may be cases where *tinnitus aurium* may be so great that the sound of the watch cannot be distinguished from the noises in the head, therefore this point, and the character of the noises, should be ascertained beforehand, and the ear not under examination be carefully closed, and the watch held parallel with the auricle. The watch test serves the purpose within useful, but not strictly accurate limits, because deep tones (speech) may be heard better than tones of high pitch (watch), therefore the power of hearing speech must also be tested, without allowing the patient to watch the speaker's lips.

In testing by speech it must be remembered that lightly spoken words may be heard some distance, and the watch not at all, or *vice versâ;* so it will be seen what a one-sided opinion may be formed as to the hearing power, by relying on the watch alone. The ear to be tested should be turned to the speaker, and the other ear lightly closed with the moistened finger, and the eyes of the listener turned from the speaker's lips. The aptitude that deaf people acquire in reading the lips, is only acknowledged when the same persons are required to close the eyes; and most of them acquire the unconscious habit, and without knowing the reason why, attempt to get opposite the speaker and look at his face. Women, especially, accustom themselves to this habit, and are such adepts at guessing, that although almost quite deaf, they can hold a conversation with others, and conceal the fact that they are deaf at all. Proper names, and bearded men, are an abomination to these ladies, for, through them, their infirmity comes to light. A whisper should first be tried, but if the deafness be very great, the loud-spoken voice should be used. Vowel sounds are heard more clearly than consonants. The acoustic characters of different elements of speech, as investigated by Wolf of Frankfort, show the relative distance at which vowels and consonants can be heard when loudly sounded. The highest and richest in tone is *a* (ah) = 360 paces. The feeblest *h* aspirate = 12 paces. Between these extremes stand: *o* = 350; *ei* and *ai* = 340; *e* = 330; *i* = 300; *eu* = 290; *au* = 285; *u* = 280; *s* = 175; *g* and *ch* soft = 130; *r* = 90; *f* and *v* = 67; *k* and hard *g* = 63; *t* and *d* = 63; *r* lingual = 41; *b* and *p* = 18.

To avoid guessing, single words should be pronounced instead of sentences; as in normal hearing, whispered words should be heard at a distance of 60 feet in perfect quietude. In testing children when complete deafness is suspected, a bell or a whistle should be used, and care taken the child does not see the source of the sound.

As a rule, high sounds are better heard by deaf people, *i.e.*, those answering to an excessive number of vibrations in a second, such as the voices of women and children; others hear low tones proportionately better; others again will vary, hearing low tones best one day, and high tones the next. Deep tones must be proportionately stronger in order to be heard equally well with high ones; for as it is well known, the voice of a basso must have a greater intensity—be stronger than the tenor—to properly fill the opera-house.

In hearing, moreover, it is not only a matter of intensity of the tone, and the number of vibrations in a second, but also of the speediness of the tones in following each other, and the space of the individual tones. A measure of the hearing which shall answer all indications, and possess practical value, must carry all these various points into view, and must also be conveniently and easily used.

CHAPTER IX.

EXAMINATION OF THE AUDITORY NERVE AND LABYRINTH.

THE basis of this examination is a comparison between osseous conduction and aerial vibration. By osseous conduction is meant the conduction of sound to the internal ear, and the brain-centre, by means of fixed sonorous bodies immediately in contact with the bones of the head. By aerial vibration is meant sound perceptible to the organ of hearing, communicated by the undulations of the atmosphere. For the purpose of this examination a tuning fork is required. It should first be held close to, but not touching the auricle. In a healthy ear the sound will be perceived for as long as the fork vibrations can be felt, the vibrations being conducted by the air to the tympanic membrane, and producing the maximum amount of impression on the nerve. If the fork now be placed on the head, it will be clearly heard in both ears, but not for so long, nor so distinctly as by aerial vibration. If both ears are closed, the fork will be heard twice as intensely as with the ears open. Close one ear and place the fork on the cranial bones, and the sound will be heard more loudly than in the open ear, so much so, as to give the impression that no sound is perceptible in the open ear at all. All these effects will be apparent when the auditory nerve is in a healthy condition; and when the ears are stopped without great pressure. These facts afford a basis for a differential diagnosis. If, on the patient ceasing to hear the fork by aerial vibration, it be quickly placed on the mastoid (protuberance behind the ear), and the sound be distinctly heard, this points to middle ear deafness; and if again, on the fork ceasing to be heard on the mastoid, it be quickly transferred to the mastoid of a person with normal hearing, and be not heard, this is a sign that the perceptive portion of the patient's hearing is good—*i.e.*, the auditory nerve is healthy. In disease of the labyrinth, the sound would be heard by aerial vibration after the cessation of the sound on the mastoid, being the reverse of the former condition.

Another test invented by the late Gardiner Brown was that a vibrating tuning fork should be heard on the bridge of the nose for exactly as long as the vibrations are *felt* by the fingers of the person holding the fork, provided the hearing power be normal. But if the auditory nerve be affected, the fork will be heard a certain number of seconds *minus* the vibrations; or *plus*, if the middle ear be affected, and the labyrinth fairly healthy. In very bad cases where the fork is not heard at all on the cranial bones, or where it is only slightly perceived, the fork should be placed on the upper or lower incisors, because it is on these teeth that the sound-vibrations are mostly appreciated, consequently, inability to hear the fork on the teeth would mark an almost hopeless case of nerve-deafness.

What is the explanation of these phenomena? Politzer gives the following reasons: —

(1) The increased resonance of the auditory canal, and the reflection upon the drum-head and ossicles of the osseous vibrations transmitted to the air in the external passage.

(2) The hindrance to the passing away from the ear of the waves of sound conducted by the cranial bones to the labyrinth and tympanum.

(3) The altered tension of the drum-head and chain of ossicles. The same effect which is produced by stopping the ear with the finger, is set up by middle ear disease; for the obstructions due to pathological changes in the middle ear which prevent the *entrance* of aerial sound waves, also prevent the *exit* of sound conducted to the auditory nerve by the bones of the head; hence, the sonorous waves are carried to the auditory nerve expansion in double strength, so long as the nerve possesses a normal power of receiving sound—the vibrations being reflected upon the nerve, so intensifying the sound of the fork. The obstructions in the auditory passages to the entrance or exit of sound waves, may simply consist of the presence of foreign substances, such as impacted wax, or catarrhal exudations of the tympanic cavity—the effect is all the same—interference with the oscillating power of the drum-head or ossicles.

There are few exceptions to the fact that a vibrating tuning fork applied to the skull, can be heard more loudly on the deafer side, provided the nerve on that side be healthy. On the other hand, a diminished perception of osseous conduction on the deafer side, as indicated by comparison with the other side, or with a healthy nerve, indicates increased tension of the labyrinthine fluid, which lessens the perceptive power of the nerve. In persons over fifty this test is not so reliable, because changes in the osseous tissues in advanced life, impair the vibratory power of the cranial bones.

There are also relative conditions which may lessen or increase the accuracy of the tuning fork test, such as hearing better in a noise, which is a sign of middle ear deafness, while hearing worse in a loud noise points to nerve-disease. So that, although this test cannot be regarded as infallible, still it serves the purpose within fairly reliable limit.

CHAPTER X.

PECULIARITIES OF AUDITION.

Audition is a relative faculty, for although most people with normal hearing can distinguish nine octaves of notes, there are some whose audition is restricted to much less. Wollaston discovered that the hearing power of a friend of his own, ceased at four octaves above middle E of the pianoforte, although his perception of musical pitch was quite correct. And, as Wollaston points out, the chirping of the cricket, the squeak of the bat, and the peeping of the common house-sparrow are of too high a pitch to be heard by somo. "The suddenness of the transition," he writes, "from perfect hearing to total want of perception occasions a degree of surprise, which renders an experiment on this subject with a series of small pipes among several persons, rather amusing. It is curious to observe the change of feeling manifested by various individuals of the party in succession as the sounds approach and pass the limits of their hearing. Those who enjoy a temporary triumph are often compelled in their turn to acknowledge to how short a distance their little superiority extends."

As already described, certain patients state they hear better in a noise—in other words, their deafness is not noticeable when spoken to in a train, omnibus, in the street where much traffic is going on, or when listening to loud music. Von Tröltsch, the eminent aural surgeon, states that "misapprehension and lack of proper observation are generally at the basis of these statements. When a noise takes place about us, we unconsciously raise our voices, so that the patient, who is less disturbed by it than we, has the benefit of this elevation of voice for his less susceptible ear." But on the other hand it has been proved by Politzer and Roosa that there actually is an improvement in the hearing power, where middle ear deafness exists, but a lessening of this power where nerve deafness exists. The chief reason is undoubtedly the fact that loud jarring sounds do not affect deaf persons, as ordinary people, and if the middle ear be defective the jarring effect on the internal ear is less great. Another reason: Loud noises press on the drum-head and auditory bones, consequently when any partial disconnection of these bones exists, the extra pressure restores the articulations of the bones much in the same way that a cotton wool pad would. The jarring effect of loud noises may be proved in this way:—When travelling in a train, people with quick hearing experience a difficulty in hearing ordinary conversation, but if the ears be stopped up with the fingers, not only can conversation be heard better, but the speaker's own voice will be more audible to himself. The pressure on the auditory bones set up by stopping the ears, prevents their free vibration and oscillation, and the "jarring" effect is prevented. The peculiarity of hearing better in a noise is termed *Paracusis Willisii*, because Willis in 1680 described a case where a husband could only make his deaf wife hear, while the servant beat a drum.

Paracusis is another peculiarity. It arises from the ear interpreting the sound incorrectly—instead of the real tone, a sound may be heard which is a half tone or a complete tone, a third or an octave, higher or lower. This is false hearing. If only one ear is affected *Paracusis duplicata* ensues, *i.e.*, a double tone is heard—true on one side, false on the affected side.

Hyperæsthesia acoustica or extreme sensitiveness to sound is also a peculiarity of audition. In fevers, hysteria, migraine, inflammation, on-coming deafness, and overstrained nerves, painfully acute hearing may arise, disturbing sleep, and rendering particular sounds or even ordinary conversation, intensely disagreeable. In these cases, disturbance of the internal ear (principally the cochlea) exists; such disturbance being induced through the circulation, acted on by reflex causes, and yielding to treatment directed to these causes constitutionally as well as locally.

The sound of one's own voice in double strength (Autophony) like speaking with one's head in a cask, is characteristic of middle ear disease, acting much in the same way as the tuning fork test already described, and people suffering from nerve deafness never suffer from this peculiarity, but on the contrary they complain of their voices being inaudible to themselves, or nearly so. Deafness to certain tones is an anomaly of audition peculiar to some people, and considered as a curious fact rather than as aural disease. There are some people, who, although they possess good and acute hearing, have never heard the chirping of a cricket, which is the highest tone we know. Helmholtz believed that the acoustic expansion in the vestibule and in the ampullæ, serves for the perception of the non-periodical or irregular vibrations, that is, for ordinary sounds; but that Corti's fibres in the cochlea are designed for the perception of the periodical movements of the air, that is, musical tones. The perception of different heights of tone is therefore a perception or sensation in different nerve filaments, and must be referred to the variety of the nerve fibres which is excited.

CHAPTER XI.

PROGNOSIS AND GENERAL AND LOCAL TREATMENT.

The prognosis of ear-diseases when subjected to prompt, judicious, and persevering treatment is not discouraging. The late Dr. Harvey found in his Hospital practice that two-fifths of the cases were cured, although some were of an apparently hopeless character, and protracted duration. The prospect of cure will largely depend upon the case not being neglected, and allowed to run its course unchecked, or rendered incurable by injudicious treatment.

Why is it so little attention is given to the beginning of ear-disease? Because there is usually no pain, or very little, and people are apt to think that a disease unattended with pain requires no assistance from art. Even ear-discharges are tolerated under the impression that the health will suffer from their being stopped, and not until the deafness becomes so troublesome as to interfere with daily intercourse, does the patient seek help, so that valuable time is lost, and organic changes occur which medical art is powerless to reach, and the deafness becomes permanent.

Of all diseases to which the human frame is subject, deafness is the one least understood by the ordinary practioner, and the one for which he invariably gives the "let alone" advice. As a consequence, the sufferer must either yield to despair or throw himself into the arms of advertising quacks, who find their pursuit a veritable *El dorado.* A spontaneous cure of deafness is very rare, and the patient that sits down with folded hands under the impression that the disease will cure itself, almost deserves the subsequent pain and humiliation which follow in the train of aural disease.

In considering general and local treatment, it must be remembered that the structure of the organ does not differ in any essential particular from other organs, and that consequently the general treatment will resolve itself into that adopted for inflammatory diseases of other parts, modified by the age, sex, habits and constitution of the patient. Acute inflammation of the ear is liable to involve the brain, or its membranes, inducing paralysis of the auditory nerve expansions in the labyrinth. And, the close vascular connection existing between the ear, nose, and throat, brain, and nervous system, and the remarkable sympathy existing between all mucous membranes, causing inflammation to spread quickly over a wide range, must be considered in treating deafness of high or low degree.

Three principal questions present themselves before the form of treatment can be decided on. (1) Is the disease organic, if so, remediable? Does it consist of inflammation, or its consequences, or is there any nervous lesion? (2) Is the disease of constitutional origin? if so, what disorder has originated the local lesion? Is it catarrh, dyspepsia, scrofula, rheumatism, gout or syphilis? In any case, treatment directed to these diseases must be pursued conjointly with local treatment. (3) Is the disease sympathetic? if so, what remote organ is affected? Here again constitutional treatment will be required.

In all these cases, certain general rules of medical practice must not be forgotten. The state of the secretions must be particularly attended to, especially the care of the skin; some cases of otorrhœa will defy all local treatment till the use of daily bathing, and occasional Turkish baths are brought to bear on the disease. Cathartics at required intervals are necessary, because ear disease is mainly composed of inflammation and its consequences. Tonics for the weak, alteratives for the dyspeptic, temperance, moderation, and everything tending to the *mens sana in corpore sano*, must not be neglected, if a satisfactory termination to the disorder be looked for.

The local treatment, too, is of supreme importance, and the progress towards cure will largely depend upon it. Injections, gargles, instillations, counter-irritation, and fomentations, all serve to arrest the disease, and must be persevered with. The general belief in the power of a child to outgrow deafness, is answerable in numberless cases for confirmed deafness, rendering later life one of extreme misery; and another popular error is to expect a speedy cure when any treatment is adopted. Deafness is a slow disease, and to successfully treat it, patience, gentleness, and untiring perseverance are required. Many patients finding they make no progress in a few weeks or months, give up in despair. The unreasonableness of this will be seen, when it is remembered that a disorder which has been years in coming, is expected to yield quickly to remedies adopted at a late stage. Another point is the inaccessiblo nature of the organ, and the difficulty of direct local treatment if the disorder be in the middle and internal ears. Here, the importance of avoiding quack nostrums may be repeated and emphasized. Equally injurious is it to use the senseless "remedies" so often advised by one's "friends." These friends, if the truth were known, would be very chary of practising their own suggestions on themselves, and it is remarkable how willing most people are to tamper with their ears, where they would not dream of tampering with their eyes. No treatment should be adopted but established remedies, founded on general therapeutics and sound scientific knowledge.

The use of the syringe has received a separate chapter, but the writer desires, in considering local treatment, to impress on the reader that it is not necessary that a deaf person should begin violent syringing the moment he experiences ear-trouble. In the majority of cases, the deafness has nothing to do with the outer ear or auditory canal, but originates in the nose and throat, and this injudicious practice often sets up worse deafness than it was meant to cure. Syringing should only be carried out on good medical advice. When it is remembered that the roof of the middle ear has a portion of the brain immediately above it; that the lower wall forms part of a fossa in which runs the internal jugular vein; that the inner wall is tunnelled by the facial nerve; and that the front wall abuts upon the internal carotid artery, small wonder indeed that inflammation of this part is frequently attended with consequences which may prove fatal.

CHAPTER XII.

SYRINGING.

Simple as syringing appears, it is rarely done properly, and injury to the ear often results. It is not necessary that every deaf person should use the syringe, yet nothing is more common than to find that the first remedy tried for deafness is syringing—in many cases with soap and water. The syringe is only required when any foreign body or impacted wax is to be removed, or where lotions are necessary to wash away diseased secretions, or to amend the morbid condition of the middle ear or auditory canal. The syringe should be small, holding from 2 drachms to ½ an ounce. The writer usually advises patients to use the smallest sized glass syringe obtainable, then force is avoided. If too great a force be used, the drum may be seriously injured, or if there be a perforation, the ossicles may be loosened from their connections in the middle ear, and the walls of the tympanic cavity be subjected to dangerous pressure. Ball syringes though better manipulated with one hand, are objectionable, by forcing into the ear bubbles of air with the water, and also because the force of the injection cannot be so well regulated.

In syringing, the point of the nozzle should be directed upward and backward, so as to convey the fluid to the depth of the canal, and at the same time the ear may be drawn upward and backward so as to straighten the canal, but this is not imperative. Care and gentleness are required to obtain the full benefit of the operation, the force being regulated by the amount of obstruction. For instance, a plug of cerumen would require considerably more force than a discharge, for in the latter case, the drum-head or ossicles would receive the full force of the injection. In any case force would not be required at all, if, before syringing, the ear be previously filled with the fluid and allowed to remain a few minutes. The point of the nozzle may be covered by a piece of rubber tubing 1 inch long, and by this means injury to the canal from a hard point is avoided, and the fluid taken more surely to the deeper parts.

There are three positions for syringing. An upright for more thoroughly cleansing the canal, and the lower part of the drum. A downward, with the ear pointing to the ground, so as to bring into play the action of gravity, when removing foreign bodies. And a recumbent position for inducing a more prolonged stay of the fluid in the canal, so as to soften wax and secretion, and to give whatever lotion is used greater facility for amending morbid conditions.

In otorrhœa, the constant use of the syringe is important, because the complaint requires, before all things, perfect cleanliness. Many cases of ear-discharge prove incurable owing to the secretion not being thoroughly removed from the deep parts of the ear. The fluid used for injecting should be slightly warmer than tepid, and an antiseptic, such as boracic acid or Condy's Fluid, added to the water. Soap or milk, should never be used, the latter contains organic material, which, if retained in the ear, will set up putrefactive processes and start fresh inflammation. Syringing may cause giddiness, nausea, and fainting, even when cautiously done; such effects are merely temporary, but are an additional warning to proceed gently. After syringing, the ear should be carefully drained and dried, and a piece of wool worn, to keep out the cold—not a large plug but a loosely drawn-out piece.

Syringing the nostrils is a very important operation in the treatment of deafness. Rather more force is required, and the best effects are obtained by pointing the syringe downward and inward, and throwing the head back to assist the fluid to pass to the throat and come out of the mouth. The effects of nasal injections on the pharyngeal orifice of the Eustachian tube, and the general effect in clearing the parts, and amending diseased conditions of the posterior nares and the pharynx, are highly remedial. Properly and persistently performed, this operation will tend to decrease tinnitus, clear the head, cause a large evacuation of mucus, and in some cases a partial return of hearing power will immediately occur. Some persons prefer to "snuff" up the fluid from the palm of the hand, or to spray the nose with a suitable apparatus, and both these methods are equally effective.

It will be seen that aural and nasal syringing both require some judgment and patience, and will prove abortive if mechanically performed. Time was, when the medical profession thought the ear was worth no more attention than syringing with soap and water, and putting on a blister; and although so rough and ready, and ignorant a way of treating so intricate a disease as deafness is a thing of the past, there are people—even doctors—who still believe in the sole efficacy of the syringe, and to cap this, lack the knowledge how to scientifically syringe either the ear or the nose.

Too much emphasis cannot be laid on the injunction to avoid force, particularly where inflammation of the deeper parts of the ear be suspected, for these parts having become relaxed by suppurative processes, are very easily injured.

CHAPTER XIII.

METHODS OF INFLATION.

In a healthy condition, the Eustachian tubes are just patent, but not sufficiently so for the free supply of air to the middle ear; but in the acts of swallowing, yawning, and other movements, certain muscles act upon the pharyngeal mouth of the tube, dilating it, and facilitating the ingress of air, and the egress of secretion; the tube being lined with ciliated columnar epithelium, the cilia so working as to remove mucus from the tympanic cavity to the pharynx. Thus the air in the middle ear is constantly renewed, and the pressure on both sides of the drum equalized.

In diseased conditions of the tube, obstruction to the passage of air occurs, turning the middle ear into a partial vacuum instead of an air chamber, as designed by Nature; this causes the atmospheric pressure on the drum-head to be excessive, and the drum and ossicles are pressed unduly inwards, setting up deafness and tinnitus. To remedy this, inflation by Valsalva's or Politzer's methods becomes necessary.

Valsalva's method consists in forcing air into the ear by making an attempt at forcible expiration with the mouth and nose closed. The imprisoned air having no other outlet is driven into the Eustachian tube, and consequently into the middle ear, condensing the air, and pushing outward the drum-head and ossicles. There is a certain "knack" required to perform this operation, which some people acquire only with difficulty. Swallowing with the mouth and nose closed, has the opposite effect, rarifying the air in the middle ear, and sometimes relieving fullness in the ears. On performing an act of inflation, a "crack" should be heard, and a feeling of distension experienced in the ear, and when no impression is made on the ears, and no air is felt to pass, it is a sign that an impervious condition of the tubes exists, and stronger methods, such as Politzer's, or the use of the catheter are required.

Politzer's method consists as follows:—the patient takes a sip of water in the mouth, the nozzle of an india rubber bag is introduced into one nostril, the other being closed with the finger, the patient then swallows the water, and the bag is compressed, and the air forced into the tube. The naso-pharynx being closed, and the throat closed by swallowing the water, this act of swallowing also assists to open the pharyngeal orifice of the tube, and the stream of air passes in. The action of Politzer's method is similar to Valsalva's, but more powerful and precipitate, but is not so well adapted for self-treatment as Valsalva's. It is not possible to localize the effects of air pressure by either of these methods, as if the resistance in both tubes be equal the air will have an exactly similar effect on both, but where the condition is unequal, the air naturally takes the course offering the least resistance, so that if one tube be pervious, and the other obstructed, these methods are of comparatively little use, and the catheter is indicated. Some increased impression, however, may be made on the closed tube by turning that side of the head uppermost, and closing the opposite ear with the finger at the moment of inflation. When, in spite of these methods the tubes remain closed, the catheter may be used, but it should only be used by an aural specialist, as in clumsy hands, lasting injury may be inflicted.

Inflation of the ear is of great value in all cases of tubal obstruction, but it should only be practised under proper advice, as its indiscriminate use will cause a flaccid condition of the drum-head, which, however, may be partly obviated by pressing in the tragus with the thumbs at the moment of inflation. Inflation combined with fumigation, affords not only relief to an obstructed state of the tubes, but it will break up and disperse abnormal secretion in the middle ear, and prevent anchylosis or rigidity of the ossicles, and also lessen thickening of the mucous membrane lining the middle ear. It also acts beneficially on the fenestræ or entrances to the internal ear, and will prevent or disperse diseased deposits on these parts, and prevent their becoming rigid.

Politzer's method is useful for children, because it can be performed without their co-operation, as on account of the greater width or capability of distension in the infantile tube, the simultaneous act of swallowing is not essential, and air forced into the nose even through a hollow tube, with the mouth closed, will pass into the ear with ease. This simple device will sometimes relieve deafness and earache in children, instantaneously.

Inflation must be performed in a gentle and prolonged manner, and all force and straining avoided to obtain the best effects, and lessen the possibility of injurious consequences. When the ears are over-inflated, as denoted by a feeling of fullness, they may be relieved by swallowing, as already described, or by making a forcible attempt to take a breath with mouth and nose closed, so as to partly exhaust the air in the middle ear, and render the drumhead more tense.

There is no fear of blowing secretion into the ear by inflation. When in the pharyngeal end of the Eustachian tube, the secretion is forced into the naso-pharynx; when in the middle ear, secretion is finely divided and scattered, and then absorbed by the lymphatics and blood-vessels; when lying on any part possessing important vibrating function, secretion is removed to other parts where it will exercise less injury. Inflation will also tend to overcome abnormal retraction of the tendon of the tensor tympani muscle; while the stream of compressed air acting laterally on the Eustachian tube, will co-operate with the tube muscles in separating the outer or membranous wall from the inner or cartilaginous one, and thus open the canal, impermeability of which is generally the result of pathological changes in the mucous membrane, preventing the effective action of the muscles. It will thus be seen that the moderate use of inflation has therapeutical effects which cannot be dispensed with.

CHAPTER XIV.

FUMIGATION.

By this is meant the introduction of vapours into the cavity of the tympanum by means of Valsalva's or Politzer's methods, or through the catheter. They may consist of simple watery vapour, or vapour impregnated with various medicaments; or, with air impregnated with volatile substances, such as Ether, Turpentine, Ammonia, Pinol, etc.

First in importance may be considered the vapour of Chloride of Ammonium. It is useful in both moist and dry catarrhs of the middle ear, and may be used for an indefinite period. Where there is much swelling of the whole mucous tract, it will be found valuable. Its judicious use will check inflammatory processes in the middle ear, prevent effusion if used early enough, disperse inflammatory deposits, prevent lymphatic and consequently osseous formation, give tone to the Eustachian tubes, and stimulate the auditory nerve. But it is obvious that in order to produce these remedial effects in chronic cases, it must be persevered with. This vapour requires a special form of Inhaler such as Godfrey's.

Next in importance is the use of Thymol, thus:

Thymol	12 grs.
Sp. vini. rect.	2 drms.
Magnes Carbon Levis	4 grs.
Water to	2 oz. mix.

A teaspoonful added to a half-pint of hot water (140° F.) should be used in a small earthenware inhaler.

Third in importance is Camphor, thus:

Sp. Camphoræ	2 drms.
Sp. Vini rect.	6 „
Water to	4 oz. mix.

A teaspoonful to a half pint of water used as the Thymol inhalation.

Where tinnitus gives trouble as well as deafness, Iodide of Ethyl should be used, in the proportion of 15 or 20 drops in half a pint of hot water.

In very intense cases of deafness, the writer has found the following useful:

Tinct. Iodi.	1½ oz.
Æther Sulph.	½ „ mix.

40 drops in half a pint of hot water; but, this should only be used as a last resource, as its use is unpleasant locally.

Whatever kind of fumigation be used, the vapour should be drawn up each nostril and the mouth in turn, and driven into the ears by Valsalva's method, without force or straining.

It is better to use a hot inhalation at night, to avoid the risk of taking cold, but Chloride of Ammonium may be used at all times. Just before a meal, or not too soon after one, is the best time to fumigate; and gargling with a cold astringent as salt or alum, should be performed directly after.

The therapeutic effects of vapours applied to the middle ear in this way, are primarily exercised on the mucous lining of the nose, throat, and Eustachian tube. Only a very small portion of the vapour can pass the isthmus tubæ, into the tympanic cavity. And vapours impregnated with volatile substances are believed to pass into the middle ear, more easily than ordinary atmospheric air.

Moist warmth alone, at a temperature of 120° or 140° F., is a powerful softening agent, and useful in overcoming obstructions of the Eustachian tube; and generally, excessive secretion will be thus checked, and the impermeability of the tubæ removed. For a short time after fumigation, tinnitus may seem intensified, and is due to the extra pressure on the fenestræ, set up by a condensation of the air in the middle ear.

Other useful forms of inhalation dispensing with inhalers are, the writer's anti-catarrhal salts given in a later chapter, and the following:

Acid Carbolic	1	drm.	
Alcohol Absol	3	„	
Liq. Ammon Fort	1	„	
Water	2	„	mix.

This should be kept in a dark, glass-stoppered bottle and used thus:—A few drops poured on several layers of blotting paper, folded in a cone, should be inspired as long as a vapour is given off, and driven into the ears by Valsalva's method. Fumigation is useless unless the vapours pass to the ear, as indicated by the signs described in the chapter on methods of inflation.

CHAPTER XV.

GARGLES.

Gargling is of great benefit to the mucous membrane lining the throat and naso-pharynx, and indispensable to the proper treatment of aural disease. But in order to obtain the best effects, this simple operation must be properly done. The general mode consists in taking the gargle in the mouth, throwing back the head, and moving the liquid about with the well-known roaring sound. In this way no parts but the teeth, dorsum of the tongue, the uvula, and the most prominent parts of the tonsils, are touched. The whole muscular action conssits of a strong to and fro motion of the uvula, and in this way there can be no contact with the posterior pharyngeal wall, and no energetic muscular contraction. The proper method of gargling consists in taking the fluid into the mouth, sitting, or better still, lying down with the head thrown back, and making repeated swallowing motions without admitting the fluid into the œsophagus. This method may first be tried with simple water, when it will be found, from the sensation experienced, that many more parts are brought into contact with the gargle, than by the noisy method commonly practised, and a greater amount of mucus ejected during, or immediately after the act, if the mucous membrane be in a congested condition. Frequent gargling, if only with cold water, is an excellent remedy in pharyngeal catarrh. Not only is an abnormal collection of secretion prevented, and a normal excretion favoured, but certain muscles of the throat and Eustachian tube are strengthened if the above method be practised, inducing greater volume and power; and the importance of these muscles for the functions of the Eustachian tube and a normal condition of the middle ear, must be borne in mind. Every striated muscle increases in power by means of constant and methodical exercise, and in chronic pharyngeal catarrh a greater power of the muscles is required, hence the value of gargling. Another important fact is, that the layer of the mucous membrane which is richest in mucus glands, lies over the muscular fibre, and consequently these glands must be beneficially affected by each muscular contraction in gargling, the muscular fibre passing round, enveloping and grasping them, and by this pressure assisting to eject their contents.

Beneficial results from gargling occur in pharyngeal, laryngeal, and aural catarrhs, when properly done. People suffering from ulcerated or congested throats, stuffiness of the nostrils, elongated uvula, enlarged tonsils, general relaxation, with excessive or abnormal secretion of the parts, with loss of hearing, and a feeling of fullness in the head or ear, are freed to a great extent from all these symptoms, and become in every way better by the use of the gymnastic exercise, as gargling may be termed; while a steadily increasing ear-affection may often be brought to a standstill. Gargling may be done 3 or 4 times daily, or oftener in acute cases.

Their composition will, of course, depend upon the nature and condition of the pharyngeal trouble, but for ordinary cases, and when it is desirable to continue their use for some time, the following may be used:—

Salt: ½ teaspoonful to a wineglass.
Alum: 2 or 3 pinches „
Borax: 1 oz. to a quart of water.
Chlorato of potash: a salt spoonful to a wineglass.
Glycerine of Tannin: 1 teaspoonful „
Bi-carbonate of Soda: ½ „ „

While alum is undoubtedly very beneficial to the membrane, it is injurious to the dentine.

A good gargle useful to singers, clergymen and all using the voice much is,

Potass Chloratis	2 drm.
Acid Hydrochloric	1 „
Water to	12 oz. mix.

Use a tablespoonful at the time.

Another for general use is:—

Acid Borici	2 drms.
Boracis	2 „
Glycerine	2 „ mix.

Dissolve in a half-pint of water and use a tablespoonful at a time.

Another which may be used in simple congestion is:—

Sodii bicarb.
Sodii Salicylatis.
Potass Chloratis of each 2 drms. mix.

2 or 3 pinches to a wineglass of either cold or warm water.

Whatever kind of gargle is used, the operation must be rightly performed, for, from a mechanical view alone, they are most important, and the reader is assured that these are no mere theoretical or *à priori* speculations, but the physiological value of gargling is of vital importance in pharyngeal, nasal and aural disease.

A very useful and pleasant gargle for children is:—

Acid Hydrochloric dil	2 drms.
Simple Syrup	1 oz.
Concentrated Infusion of Roses	2 „
Water up to	1 pint mix.

A tablespoonful at the time.

A gargle which often succeeds in very intractable cases is:—

Phenosalyl	40 minims.
Glycer.	2 oz.
Aq. men. pip:	6 drms.
Water.	10 oz. mix.

Half fill a wineglass and fill up with warm water.

CHAPTER XVI.

BATHING.

In the treatment of deafness, as in every other disease, bathing and the care of the skin are indispensable. Baths may be cold, tepid, or hot, and are respectively, bracing, soothing, and stimulating. Cold bathing is not, as a rule, beneficial to the hearing of people predisposed to aural disease, but there are exceptions to this. All that is required is attention to the effects of it in each individual case, and the protection of the ears in diving, etc. We hear a great deal about making people, and especially young people, hardy by cold bathing and exposure, but such Spartan habits do not suit every constitution, and when ear or other mischief results, common sense would warn us to desist. Too frequent and prolonged bathing, is a common cause of disease of the Eustachian tube in young persons, and where this is found to be the case, "ducking" must not be practised, especially in sea-water. Sea-water by its peculiar composition, is more irritant than fresh water, and if it enter the Eustachian tube through the nasal meatus, as may very easily happen in children, owing to the larger distention of the pharyngeal orifice of the tube, more or less catarrh of the tube with deafness will be set up, so that when the head is immersed the nostrils should be lightly pinched.

With respect to the entrance of water into the auditory canal, precautions are again needed. Sea-bathing has been found to cause very obstinate cases of drum thickening; to irritate the canal, and cause *otitis externa;* or chronic discharge, which in time may involve the middle ear. A piece of wool dipped in oil and lightly inserted in the ears will prevent the ingress of water under ordinary circumstances.

In the case of delicate and strumous children just recovering, maybe, from serious illness, which, possibly, has affected the hearing, the beneficial effects of sea-bathing are very manifest, and combined with an outdoor life, will do more good than all the drugs in the Pharmacopœia; but, just at this juncture, it is trebly important that the ears and nostrils should be protected, and "ducking" forbidden. A recent perforation, or inflammation of the Eustachian tube, will at once respond to the evil effects of water entering these parts, and perpetuate what otherwise might only have been a temporary trouble.

Bathing in hot salt water is beneficial in aural disease, and even the practice of daily wringing out a towel in cold salt water, and applying it with friction to the skin, is remedial. The ear secretions are affected to a very great extent by the state of the skin, and thus the cutaneous function should never be overlooked by deaf people.

But of all kinds of baths, the most useful in aural trouble and noises in the head is the Turkish bath. In deafness, obstruction of the Eustachian tube, congestion of the middle ear, hypertrophy of the pharynx, and *tinnitus aurium,* with disease of the respiratory passages, the Turkish bath is most efficacious, and its important physiological action in the cure of disease demands a special chapter entirely devoted to its descriptive examination.

CHAPTER XVII.

THE TURKISH BATH.

HAVING been advised for nearly every form of deafness in this book, it is only consistent to give a few particulars and instructions regarding it. The name "Turkish bath," is a misnomer. "Thermo-Oxygen Bath" would be more correct, though it sound pedantic. Thermo-chemistry is that department treating of the development of heat by combined electrical and chemical action. The first effect of this bath is to cleanse the system, obnoxious and effete matters being eliminated from blood and skin. Oxydation of the blood occurs, the vascular system being purified and invigorated by an exchange of gases—carbonic acid gas being replaced by oxygen.

Its relation to the senses cannot be overestimated, when we consider that the sensorial perceptions depend on the health of the body, and what we hear, see, feel, taste, and smell, enable us to "think," which is the mind's supreme function. Therefore, if the senses are expected to be acute, or the first inroads on their perfection arrested, the body must be kept in a healthy condition.

The beneficial action of the Turkish bath on the blood and tissues, and the nervous system, will become apparent almost from the first, and by seeking to arterialize the blood by taking a dose of life-giving oxygen, and cleansing the wheels of the bodily apparatus, is surely the way to induce sound faculties.

Noises in the head, often apparently incurable, yield to the Turkish bath, where the trouble arises from weakened nerve force, induced by diseased blood. Failure to produce a proper contraction of the blood-vessels will cause the blood to rush through these vessels, bounding and rebounding against the skull, and setting up tinnitus in all its varied horrors.

Many have asked the writer the connection between deafness and Turkish baths, since he so often advises them for aural disease. Firstly it is obvious that what improves the health will improve the hearing; for the ear is only part of the whole, and sympathises with the general state of the body. Secondly, the action—tonic and stimulating—of dry heat on mucous membranes and the sudatory glands, must be considered; for sufferers from nose, throat, and lung congestion, derive almost immediate benefit from the topically thermic action of the hot dry oxygenated air, this effect passing up the Eustachian tubes if inflation be performed during the bath, and acting beneficially even on the middle ear membrane. Nerve deafness, incurable as it is, may sometimes be brought to a standstill, if taken in good time, and the nervous system be strengthened, and judicious local treatment be combined with the bath.

Many consider the bath dangerous to elderly people, or to those with heart-disease. This is a fallacy which is fostered by the medical profession. There is no danger when common-sense precautions are taken, and weakening effects to the most delicate need never be feared. Briefly, the bath is a blood-cleansing, blood-improving, and blood-circulating process. Attention to the following points will insure the full benefits:

1.—Not to be taken before breakfast.
2.—To allow 2 hours to elapse after a meal.
3.—To avoid alcohol before the bath.
4.—To avoid prolonged sweating.
5.—To cool down thoroughly before dressing.

If the bath be taken too soon after a meal the process of digestion is interfered with, and would thus set up general derangement, for which the bath would be blamed. And if alcohol be taken before, or even sugar, the heat of the bath will set up fermentation in the stomach, with consequent unpleasant sensations.

It should be noted that a first bath invariably induces a feeling of slight *malaise*. This may be physiologically explained. One bath cannot reverse the internal order of things, existing maybe many years, but rather increase them till the exhalating and evaporating process be established. And because one bath does not produce instantaneous perfect health, it is considered useless or dangerous. As well might one expect a doctor to cure with the first dose of physic he prescribes.

When this bath is adopted for deafness, it is advisable to take one every 8 or 10 days, gradually increasing the stay in it, and to inflate the ears gently at intervals throughout its progress.

The bath may be taken by the aged, debilitated, weak, and consumptive, with benefit, and no ill results can arise, apart from a feeling of nervousness at unusual surroundings. Finally, a Turkish bath is not a prison, and anyone finding really ill effects is at liberty to leave the establishment there and then.

CHAPTER XVIII.

SLIGHT DEAFNESS.

Many people (one might say, most people) find themselves troubled at some time of their lives with slight deafness. It may attack one ear or both, it may result from a "cold in the head," or may be the outcome of a serious illness. In any case, being slight it is left alone for one of two reasons: it causes no serious inconvenience, or it is feared that any interference will aggravate it. It may pass away, but in the majority of cases its tendency is to increase. The want of knowledge what to do in such circumstances is also a natural reason for the let-alone policy, in addition to which, there may be no pain or abnormal sensation. The first point to be considered in these slight cases is, does the deafness originate in the nose and throat, or in the ear itself? The writer's desire is to explain how this may be ascertained, and to instruct how to proceed to cure. In the first place, gentle inflation should be performed, and if the air does not pass to the deaf ear, or if it pass with unusual ease as compared to the good ear, it may be rightly assumed that the deafness is caused by either a slight imperviousness of the Eustachian tube, or by a swelling of the lips of the pharyngeal orifice. In either case the following treatment is safe and sound.

Syringe the nose morning and night with one teaspoonful, to a wineglass of warm water, of—
Glycer. boracis,
Sp. vini. rect., of each 1½ mix.
And gargle the throat with cold salt water.

Then the deaf ear may be gently inflated, being turned upwards at the moment, and the other being stopped with the finger. In most cases the hearing will be found normal in the course of 10 or 14 days, particularly, if, in addition, this medicine be taken:—

Potass. Iodidi., 1 drm.
Sp. Ammon. Arom.,
Tinct. Gentian. Co., of each, 2 oz. mix.
1 teaspoonful to a wineglass of hot water twice daily after food.

If no improvement occur, attention should be given to the ear itself, though if a feeling of fullness or itching in the ear be experienced, this course should be tried before the first.

Drop into the ear at night:—

Liq. Morph.		
Glycer. of each,	1½	drms.
Pulv. Acid boracic	10	grs.
Water to	1	oz. mix.

The bottle should be stood in hot water till the contents are fairly warm, then 20 drops should remain in the ear 15 minutes, followed by gentle syringing with a wineglass of warm water containing a teaspoonful of glycerine. This may be repeated every night for a week, the ear to be carefully dried afterwards, and the effect noted.

The two foregoing treatments may be tried together, and really constitute taking the trouble at each extremity. No harm to the auditory apparatus will ensue in any case, and if no immediate improvement occur, the treatment will have the effect of staying the further progress of the deafness.

CHAPTER XIX.

NASAL CATARRH.

This is largely answerable for aural troubles. Not because it is a very malignant complaint, but because it is fostered by inattention to little rules of health; and because, in common with the throat, the position and functions of the nose render it subject to every change of temperature, and also because, indispensable as the human proboscis is, it is not thought worthy by the majority of people of special medical treatment. The common practice of drinking hot liquids just previous to going out in the cold air, will not only start catarrh, but keep one going for years. The mucous membrane lining the nose and throat becomes hyperheated, and before it can resume the normal temperature, contact with cold induces a condition of mild inflammation and congestion, which, becoming chronic, affects the hearing through the Eustachian tubes. Much the same effect is produced by drinking cold liquids when very hot, and by passing from a heated atmosphere to a cold one, or even the reverse. People do, as a rule, take some care in passing from warm rooms, but few think of the mischief which may also be set up in passing from cold to overheated rooms. Another means of propagating this trouble, as well as rheumatism, is the habit of wearing the same boots and shoes day after day. The perspiration of the feet is more copious than other parts, except the head, and this perspiration cannot evaporate through the leather as through the clothes, owing to the impervious nature of the leather, hence it condenses on the inside, and is partly absorbed by tho leather, and capable of chilling the feet, if the boots are worn before the moisture has evaporated. Badly ventilated rooms, especially bed-rooms, are also a prolific cause of nose, throat, and lung disease; for fresh air night and day, summer and winter, is of vital importance, and should always be secured.

The tendency to Acute Rhinitis, or ordinary cold in the head, is partly hereditary, and somewhat contagious. Exposure to damp, when the system is below par, being the principal exciting cause. Once started it will run its course, and only mitigation is possible. The following medicine may cut short the attack, but it must be promptly administered:—

Liq. Ammon. Acetat.,	12 drms.
Tincture opii.	40 minims.
Sp. Ætheris Nitrosi.,	80 minims.
Aq. Camphorœ to	4 oz. mix.

¼ part every 6 hours for 4 doses.

The inside of the nose, may be painted with the following, 2 or 3 times daily:—

Menthol,	½ drm.
Almond Oil,	1 oz. mix.

The following smelling salts are useful in warding off an attack, and for use during one:

Acid Carbolici Liq.	1 drm.
Ammon Carb.	2 „
Pul. Carbon Ligni	2 „
Tinct. Benzoin Co.	1 „
Ol. Lavandulœ	6 m

Liq. Ammon Fort. (Q. S.) mix.

People liable to "cold in the head," should regulate their mode of living, and study rules of health. "Coddling" is pernicious, rendering the skin susceptible to every change in the temperature, so the least draught will upset the heat-regulating centre. The cold bath is undoubtedly useful, when it is found to agree, but not all persons can endure it. The great secret of cold bathing is vigorous friction afterwards, so as to develop the "reaction." Turkish baths are specially to be recommended. Overeating predisposes to cold, and pastry, and sweet things generally, increase the tendency.

Chronic Hypertrophic Rhinitis is a development of the foregoing: The nasal mucous membrane becoming permanently swollen, and free nasal respiration interfered with. It is a most intractable disease, and requires much patience to overcome. Obstruction of the nose, increased secretion, a feeling of stuffiness, with more or less oral breathing; are the prominent symptoms. If the turbinated bones are much swollen, smell and taste are lessened, and impaired hearing results. Headache, giddiness and lassitude, all arise in this condition, and even acne proves incurable till the nose receives attention. Locally, much good may be done by nasal injections and sprays, one of the best for spraying being the following:—

Acid Carbolici,	2 grs.
Sodii bicarb.,	12 „
Boracis,	12 „
Glycerine,	40 minims
Water to	2 oz. mix.

after a week's use of the above, the following may be used, and will give considerable relief to the stuffiness:—

Resorcin,	5 grs.
Water,	1 oz. mix.

Paints are also useful, such as the Menthol and Almond Oil already given, or this spray:—

Thymol,	½ gr.
Sp. vini rect.	½ drm.,
Glycer.,	½ „
Water to	1 oz. mix.

Ointments such as Iodoform, Spermaceti, Vaseline, or the following, are all highly serviceable in obstinate cases, and should be used at night:—

Liq. Atrop. Sulph.,
Ol. Eucalypti, of each, 1 drm.
Vaseline, 1 oz. mix.

Though nose affections do not usually threaten life, they render it unbearable. Prompt attention should always be given to children, as taken at the onset nose complaints will yield to soothing treatment. The following medicine will often do considerable good:—

Ferri et Ammon Cit.,	2	drms.
Liq. Arsenic (Fowler's),	1½	„
Glycer.	1	oz.
Water to	4	„ mix.

1 teaspoonful in half a wineglass of water thrice daily after food; and weakly children should have:—

Pot. Iod.,	8	grs.
Ferri at Ammon Cit.,	24	„
Syr. Simp.,	1	oz.,
Water to	4	„ mix.

A teaspoonful thrice daily in a little water.

Or Nourry's Iodinated wine may be given.

It is impossible in a book of this description to describe all forms of nasal disease, the foregoing (acute and chronic) are the most common, and therefore selected for treatment in this modest chapter. Attention to the beginning of nose trouble will usually prevent extension, and complication. Two objects must be kept steadily in view: (1) To remove secretion and disinfect the passages; (2) To check hypersecretion, and arrest the chronic hyperæmic swelling and thickening. The various preparations of Glycerine are very remedial, and as they are easily obtained, will do good in the early stages. Glycerine of Borax is cleansing, healing, and deodorizing. Glycerine of Carbolic Acid also. Glycerine of Tannin, and Glycerine of Alum check hypersecretion, and are astringent. All these preparations may be used in the proportion of from a half to one teaspoonful to a wineglass of warm water, according to the sensitiveness of the membrane, either for syringing the nose or "snuffing" up from the palm of the hand, which some people find more easy to accomplish.

Some forms of purulent nasal discharge which defy ordinary treatment, are due to disease of certain sinuses, communicating directly with the nasal passages. These sinuses are lined with a continuation of the same mucous membrane as the nose, and are subject to the same diseases. Direct treatment for evacuation and irrigation of the sinuses is required, which patients cannot carry out themselves, but which, properly performed by a specialist, will often bring about a speedy cure of even very long standing discharges. When one nostril alone has an offensive discharge, this form of disease may be assumed with greater certainty than when the discharge is bilateral.

The tendency to hay-fever and asthma is largely due to the abnormal condition of the nose set up by chronic catarrh. Ozæna is also caused by an atrophic condition of the nasal mucous membrane; and in this case much injury is done to the general health by the constant inhalation of the gases of decomposition; the digestive organs, too, are undoubtedly injured by the unconscious swallowing of the decomposing pus.

It is only of late years that special attention has been directed to the effect of the nose and its diseases on the general health. Epilepsy, headache, vertigo, dyspepsia, gastritis, deafness, ocular troubles, and even brain disease, may all occasionally be traced to nasal complaints; undergoing a spontaneous cure when the abnormal nasal condition is rectified.

CHAPTER XX.

ADENOID VEGETATIONS.

This is a disease of childhood, and may appear as the after-results of diphtheria, scarlet-fever, measles, and other debilitating illnesses; or it may be hereditary. Dr. Meyer of Copenhagen was the first to draw attention to the complaint, and his observations were afterwards confirmed by Guye of Amsterdam, and Lœwenburg of Paris.

The disease consists in an excessive growth of certain glandular tissue in the naso-pharynx, which causes obstruction to the nasal passages; and extends to the mouths of the Eustachian tubes, veiling them, and causing deafness, with ear-discharge; and setting up a condition of chronic nasal catarrh. Between the ages of 3 and 15 this condition is most common, and about the age of puberty the growths tend to atrophy and come away, in fact a spontaneous cure usually occurs. The evil effects of their long continuance, however, remain; such as deafness, chronic catarrh, etc.; hence, the great importance of early treatment. The signs are very striking. There is obstructed nasal breathing, and the child sleeps with open mouth. There may be, in bad cases, complete inability to blow the nose; deafness of more or less intensity, with or without ear-discharge; tendency to take a "cold in the head"; defective nasal resonance, and at times inability to pronounce "m", or "n", such words as "common," for instance, being pronounced "cobbod." The appearance of the face is characteristic, the mouth half open, the nose thin and compressed, and a stupid inattentive appearance generally. There may also be enlarged tonsils.

In very bad cases, operation for removal of the growths with subsequent cauterization is imperative, but in mild, early detected cases, a cure may be brought about by persevering local treatment.

This should consist in painting or spraying the nose 2 or 3 times daily; and if pleasant tasting fluids, causing no pain, be used, the child will be more readily treated.

The first spray should consist of one teaspoonful of Glycerine of Borax to 2 oz. of water, and in slight cases this will suffice. The next should be Glycerine of Alum in the same proportion. A more effective solution is made by using:—

Tinct. Ferri Perchlor.	1 drm.
Sp. vini rect ,	2 oz. mix.

Using 1 teaspoonful to 2 oz. of water.

A still more effective spray is

Acid Chromic,	10 grs.
Water,	2 oz. mix.

This should not be used with children under 10 years of age, nor swallowed by any.

The use of sprays sometimes sets up pain and irritation in the nose; in such cases, no time is lost by discontinuing their use for 48 hours, and substituting emollient applications, such as Vaseline, Lanoline, or Iodoform ointment, passed down the nose with a camel-hair brush.

Paints may be used, and in some cases prove more effective. Such as:—

Ferri Perchlorid,	30 grs.
Glycerine,	2 drm.
Water to	1 oz. mix.

or the following:—

Iodi,	5 grs.
Potass Iodi,	10 „
Ol. men. pip.,	3 minims.
Glycerine,	1 oz. mix.

The last has proved very beneficial in many cases, combined with the administration of the syrup of Iodide of Iron, in teaspoon doses, three times daily. Or better still:—

Syr. Ferri Iodid.,
Syr. Phosphat Co., of each, 2 oz. mix.
1 teaspoonful in half a wineglass of water thrice daily after food.

Tho throat must be treated with astringent gargles, and if enlarged tonsils exist, thoy may be painted with Perchloride of Iron in tho proportion of 2 drms. to 1 oz. of Glycerine.

Another good Spray useful for children is:—

Boracis,	1 drm.
Glycerine,	1 „
Rose Water, to	4 mix.

1 or 2 teaspoonfuls to 1 oz. of tepid water. The ears should have attention if a discharge exists (as indicated in another chapter).

A fluid ounce consists of two tablespoonfuls.

A damp climate is favorable to the production of adenoid vegetations, and they are lessened by sea and mountain air, and a hygienic life.

CHAPTER XXI.

THE THROAT.

In connection with ear-disease, the throat requires careful and persevering treatment. When it is simply relaxed, frequent gargling, and the use of medicated pastilles (such as Allen and Hanbury's), will suffice, provided the gargling is properly carried out as described in Chapter 15. When congestive swelling occurs, stimulating paints are required, and if used in time, few excel the use of Nitrate of Silver, in the strength of 30 grs to the oz. of water; and Chloride of Zinc, of the strength of 15 grs. to the oz. of water. Applied with a proper throat brush, once daily, the throat will derive immediate benefit. There are two conditions of the throat commonly called "sore throat," which require special attention—acute and chronic pharyngitis, the second condition being a development of the first. In the acute condition, there is usually tenderness, swelling, and dryness of the throat, followed by excessive secretion, pain in swallowing, with cough. The nose may participate, in which case there will be deafness and ear-ache. Or, if the inflammation extend downwards, there will be hoarseness, loss of voice, and increased cough. This condition may be produced by zymotic disease, or by a chill, usually the latter. The important question is, what should be done in such cases? for it is upon the promptitude with which treatment is adopted, that a favorable termination with no bad after consequences will result. The sufferer should remain in bed, or at least in a warm well ventilated room. A saline aperient should be taken. If cold dry winds prevail, a bronchitis kettle should be used. The skin should be acted upon by warm baths and warm drinks. Guaiacum in 5 gr. doses mixed with black currant jam, will do great good, taken every 4 hours; or the following mixture:—

Tinct. Guaiaci Ammon.,	3 drms.
Tinct. Aconiti,	20 minims.
Aq. Camph. to,	6 oz. mix.

$\frac{1}{6}$th thrice daily.

Painful cough may be treated with the following linctus:

Liq. Morph. Hydrochlor,	36 minims,
Sp. Chlor.,	36 "
Glycerine,	12 drms. mix.

A teaspoonful in a little water every 4 hours.

In the acute stage, gargling is useless, but the following applied to the throat (and the nose if necessary), will give great relief:

Menthol,	30 grs.,
Vaseline,	1 oz. mix.

The cold compress applied to the neck (wet linen wrung out in water, wound round the neck, and carefully covered with dry flannel), will materially assist the cure. If these common sense precautions are promptly acted upon, a few days will end the trouble, but neglected cases will develop the chronic variety, which is far more serious.

Chronic Pharyngitis, is usually complicated with gastric catarrh, and liver disorder. There are two pathological conditions of Chronic Pharyngitis—the hypertrophic and the atrophic. The first is distinguished by a swollen condition of the mucous membrane, with hypersecretion; the second by a pale, dry appearance, with little secretion, but great inclination to "hawk," and greater discomfort. Either form is troublesome and obstinate, requiring prolonged treatment to overcome. This treatment to begin with, must include attention to underlying causes. The alimentary canal must be rendered healthy and active; the skin kept open; flannel worn next the skin; Turkish baths adopted; smoking avoided; stimulants moderated; pungent foods abstained from; and tonics taken.

Mineral waters, such as Hunyadi Janos or Apenta, are eminently useful, taken on rising; or other saline aperients. Iron or Arsenic, are specially indicated, or both combined. The following is useful:

Syr. Ferri Iodid.,	½ oz.
Glycer.,	1½ „
Water, to	4 „ mix.

1 teaspoonful in a little water thrice daily after food. Or:—

Liq. Sodii Arseniatis,	36 minims.
Sodii Hypophosphitis,	120 grs.
Tinct. Chlorof. Co.,	2 drms.
Water, to	6 oz. mix.

$\frac{1}{12}$ part in an equal quantity of cold water, thrice daily after food.

The local treatment may consist of gargles, sprays, or inhalations. Astringent gargles as given in Chapter XV may be used. The menthol and olive oil will do good. The following spray will often answer:

Acidi Borici,	12 grs.
Boracis,	12 „
Sodii Chloridi,	6 „
Water, to	2 oz. mix.

Or this, used as a spray 2 or 3 times daily:—

Liq. Iodi,	12 minims.
Acid Carbol. Liq.,	6 „
Water to.	2 oz. mix.

Paints may consist of the following:—

Cupri. Sulph.,	20 grs.
Glycerine,	2 drms.
Water to,	1 oz. mix.

or:—

Ferri Perchlor.,	40 grs.
Glycerine,	2 drms.
Water, to	1 oz. mix.

or:—

Ferro-Aluminis,	40 grs.
Glycerine,	2 drms.
Water, to	1 oz. mix.

or:—

Alumnol	1 drm.
Glycor	½ oz.
Water to	1 „ mix.

When tho atrophic form is present, great improvement will be brought about by Godfrey's Chloride of Ammonium Inhaler, used 2 or 3 times daily, with salt water gargling. But, whatever form of treatment is adopted, it is not wise to continue one remedy too long, without variation, as even a beneficial application is apt to lose efficacy by prolonged use. To some extent this aphorism does not apply to chloride of ammonium.

There is another form of throat trouble, which affects clergymen, vocalists, public speakers, teachers, and those generally using the voice; complicated by more or less laryngitis. In these cases, overstrain of the vocal organs is more often the exciting cause than colds, etc. The trouble is very inveterate, because, firstly, the originating cause,—over-use of the voice—is still present; and also because these sufferers are usually over-sensitive and hypochondriacal. The vocal cords may participate, rendering the case absolutely hopeless unless perfect rest with change of air be taken for some weeks. The symptoms are chiefly dryness, itching or burning of the throat, with desire to "hawk." The voice becomes tired and fades away as speaking is continued; deficient tone is noticed, with rigidity of the larynx, and if this condition be long continued, a condition of either unilateral, or bilateral paralysis of the vocal cords will arise. The treatment must be directed to the general health, and rest for the voico; these two conditions absent, local treatment will prove of little power. Iodide of Potassium in small doses will often do good—thus:—

Pot. Iod., 1 drm.
Sp. Ammon. Arom.,
Tinct. Gentian Co., of each, 2 oz. mix.
1 teaspoonful in a wineglass of hot water twice daily after food.

In other cases dilute phosphoric acid, and nux vomic, will have the happiest effects:—

Acidi Phosphorici dil.,	2 drms.
Tinct. Nux Vomica,	1 "
Water, to	6 oz. mix.

$\frac{1}{12}$ part in an equal quantity of cold water 3 times daily after food.

Local treatment may consist in painting the throat with nitrate of silver, 30 grs. to the oz. of water, followed by gargling with cold salt water; or by using the perchloride of iron in glycerine (already given). If there be much "hawking," but little secretion, the following inhalation will do good :

Creasoti,	40 grs.
Mag. Carbon. levis.,	30 „
Water to,	2 oz. mix.

Place 1 teaspoonful in half a pint of hot water, and inhale at night through a small earthenware inhaler, and gargle with some of the water.

If there be excessive secretion, the following will be more useful :—

Ol. Cubebs,	40 minims.
Mag. Carbon. levis.,	20 grs.
Water to,	2 oz. mix.

Used as the previous inhalation.

If granulations occur (granular pharyngitis), they will require cauterization, but as this is not adapted for self-treatment, the writer merely refers to it.

The amount of discomfort experienced by patients is often out of all proportion to the objective symptoms; and the beginning of the complaint is mostly denoted by a desire to clear the throat before speaking. At this juncture, the further progress may be positively arrested by the following as a throat paint :—

Tinct. Iodi.,
„ Catechu,
Glycerine, of each, 2 drms. mix.

All visible parts of the throat may be touched twice daily, and a final dip into the larynx made at the end of the application. In some cases of hyperæsthesia of the pharynx, the following soothing inhalation will often benefit the sufferer :—

Balsam Peru,	5½ drms.	
Sp. vini. rect.	2½ „	mix.

30 drops in a half pint of hot water, through an earthenware inhaler, used every night.

The prolonged use of the Phenosalyl gargle given in Chapter XV will prove effective, or the following spray :—

Zinci Chlorid.	2 grs.
Ac. hydrochlor dil.	3 minims
Tinct. Limonis	15 „
Aq. destill. to	1 oz. mix.

Used thrice daily. The breath to be inspired at the same time.

A good tonic often works benefit:—

Quiniœ Sulph.	12 grs.
Ac. Phosphorici dil.,	1½ drms.
Tinct. Lupuli,	6 drms.
Water to	8 oz. mix.

⅛ thrice daily between meals. (Not on an empty stomach).

Some cases of so-called throat disease, are not, in reality, throat disease at all, but merely an irritated, or inflamed condition of the mucous membrane of the pharynx, due to a nasal discharge trickling down the posterior pharyngeal wall; and on the nose receiving suitable treatment, the throat will recover perfect health. Thus, many cases of pseudo-throat disease never respond to direct treatment, simply because the irritation of the nasal discharge is continued. In very pronounced cases of nasal disease, such a discharge may be so acrid as to excoriate the skin, and its aggravated action on a delicate mucous membrane may therefore be imagined.

CHAPTER XXII.

EAR-ACHE.

Pain in the ear, whether it be constant or intermittent, is not a disease *per se*, but like tinnitus and otorrhœa, it is a symptom of disease, and may accompany nearly every morbid condition of the various structures of the ear. To successfully treat it, it is necessary to inquire into the whole history of the case, to ascertain whether the pain be the consequences of mere irritation, or inflammation, or whether it be of a neuralgic character. The severity of the pain will, to some extent, indicate the amount of mischief on which it depends. Thus, a slight pain may be due to some irritation in the auditory canal, which would be bettered by filling the ear with equal parts of warm water and glycerine, or equal parts Liq. Plumbi Subacet and warm water. Neuralgia of the ear may be distinguished from the pain of inflammation by the sudden intensity of the pain, which is throbbing, goes and comes capriciously, and does not progressively increase in severity. Intense and intermittent pain unattended with inflammatory symptoms, is indicative of neuralgia only. This is usually accompanied by some derangement of the system, such as dyspepsia, rheumatism, and gout. Carious teeth will often cause the most intense ear-ache in adults, and they should direct attention to their molars, for on decayed teeth being drawn or "stopped," the pain will depart without further treatment. The numerous cases of ear-ache in children proceed from various causes, such as teething, zymotic disease, and severe colds: all setting up inflammation of the middle ear. Cold bathing in adults is answerable for much ear-trouble, especially if it be persisted in when the pain first arises. Excepting boils in the auditory canal, no pain is equal to the excruciating ear-ache proceeding from inflammation of the middle ear, and in these cases the pain will continue till a discharge supervenes, shewing that the drum is ruptured. Then is the time to give proper attention to the discharge to avoid life-long deafness.

What is required to be known, especially with children, is how to cure ear-ache? First of all, the patient should be quiet and lying down. The ear may be filled with equal parts of glycerine and hot water, and a flannel wrung out in very hot water placed round (not *over*) the ear. If this fail, the following solution may be used, 20 drops warm to be left in the ear for 10 minutes:

Glycer	1 drm.
Ext. Opii. liq.	3 „
Liq. Plumbi dil.	1 oz. mix.

or 10 drops of the following way be used warm:

Morphinœ	3 gr.
Glycer.	1 drm.
Water	1 oz. mix.

For children, the ear may be rubbed all round with equal parts of belladonna and glycerine, using a little friction with the finger. Another simple remedy is to breathe into the ear for several minutes. Another, to insert a piece of rubber tubing in one nostril, to close the other, and give one or two blasts of air with the mouth through the tubing. This simple device often cures ear-ache at once by opening the Eustachian tube. In very obstinate cases, a few drops of chloroform may be sprinkled on a warm dry flannel, and placed over the ear. In severe cases of middle ear inflammation, the pain will not cease till a discharge occurs, and the inflammatory symptoms subside. An aperient like castor oil may be given.

Adults may use the morphia instillation given above, and rub round the ear this liniment:

Lin. Opii	
„ Belladon	
„ Chloroform	
„ Aconitii, of each	2 drms.
„ Saponis	½ oz. mix.

and insert a pellet of cotton wool in the ear, dipped in:

Atropinæ	1 gr.
Morphinæ	3 „
Ol Eucalypti	½ drm.
Water	2 drms. mix.

Gentle inflation of the ears may be tried, and in bad cases a few drops of the above anodyne may be dropped into the ear.

The moment the pain ceases and the discharge appears, the ear should be syringed gently with:

Liq. Plumbi Subacet,		
Liq. Morph.	of each,	½ oz.
Water to,		10 oz. mix.

Use a tablespoonful in a wineglass of hot water, and insert a wool plug in the ear to protect it and absorb further discharge.

A good internal remedy is:

5 gr. Croton-chloral-hydrate to the oz. of water,

and a teaspoonful may be taken every 4 hours for 3 days; and children may have it every 6 hours for one day.

Hot baths, and Turkish baths, give a certain measure of relief; also hot mustard and water foot-baths on retiring. They act as counter-irritants. A good tonic for adults suffering from ear-ache is:

20 "steel" drops in a wineglass of water, thrice daily.

Quinine is useful in cases of pure Otalgia, with or without Iodide of potassium, but it is contra-indicated in cases of deafness with noises in the head. The following may be tried:—

Quiniæ Sulph.	16 grs.
Pot. Iod.	48 „
Water to	8 oz. mix.

2 tablespoonfuls as a dose.

Pain in the ear may be complained of when objective examination shews no inflammatory process, and in an intermittent way, may trouble for months or even years. This is really a part of a general neuralgic affection of the fifth nerve, and may also be reflex from the teeth, or ulceration of the pharynx or larynx. Pressure on the nerves inside or outside of the ear, may also be the cause. Inside the ear this pressure may be exerted by a catarrhal thickening of the mucous membrane, exciting pain at the side of the head. These cases are benefited by vesicants behind the ear. A small mustard leaf, or the application of the liniment of iodine giving relief. The subsequent pustulation to be treated with warm bathing, and the application of vaseline.

Nervous Otalgia is sometimes found associated with great exhalation of the auditory function, and occurs occasionally as an idiopathic affection in nervous and highly irritable people, and it bears an analogy to irritability of sight; in fact the external senses, especially sight and hearing, greatly sympathise with each other.

Excessive acuteness of hearing arises from a morbid excitement of the nerves, sometimes of the whole auditory apparatus, but more often of some particular part, as the tympanum or labyrinth. It is frequently associated with ear-ache, head-ache, and acute jaw pain. This acuteness of hearing with pain, is usually periodic, and has a rheumatic basis; and the hearing is so painfully sharp at these times as to render whispering in a room quite intolerable, while even noises not previously noticed become distressing. To a slight extent relief is obtained by lightly inserting a wool plug into the ear, saturated with the Morphia and

Atropine solution already given, and the administration of the following:—

Pot. Bromid.	
Chloral-hydrat., of each	1 drm.
Syr. Aurantii	½ oz.
Water	6 oz. mix.

⅙ at bedtime, or even 3 times daily in bad cases.

CHAPTER XXIII.

TINNITUS AURIUM (NOISES IN THE HEAD).

Noises in the ear are a symptom of disease, generally due to some existing lesion or disturbance of function. It is a most distressing complaint, often attacking people in poor health, or the decline of life, and varying from a slight rushing or humming sound, which is only observable when the sufferer is alone and quiet, to noises of the most maddening description. The complaint may be associated with deafness, or exist with hypersensitive hearing power, and in the latter case it may point to an irritated condition of the auditory nerve, and its expansion in the labyrinth, induced by certain morbid processes in the ear; or by derangement of the nervous system, caused by anxiety, worry, mental exhaustion, and over study; or by abnormally excited conditions of the brain, either proceeding from this organ itself, or reflected upon it by any sort of poisoning, or intoxication. Certain drugs, as quinine salicin, and alcohol will produce both deafness and tinnitus, the effects passing off on discontinuance, provided they have not been continued too long. Pressure on the fluid of the labyrinth, caused by catarrhal processes in the middle ear, or Eustachian tube, also produce noises, by inducing an indrawn condition of the drum-head, whereby the auditory bones are pressed inwards on the fenestra ovalis (entrance to internal ear); and chronic conditions of the tympanum also bring about a rigidity of the membrane of the fenestra rotunda, so that it cannot relieve the pressure on the labyrinth by moving outwards. Disturbance of the vascular system, plethora, rheumatism, gout, and constipation, may all or each be the cause, but there can be no doubt that the noises largely depend on diseased conditions of the ear, and especially of Chronic Dry Catarrh of the middle ear (Sclerosis). It is a common symptom in all forms of ear disease, and is sometimes a greater trouble than deafness itself. The most serious and incurable forms of tinnitus are connected with affections of the labyrinth and auditory nerve. The sounds are divided into two classes —objective and subjective. The first being those due to the actual presence of sonorous vibrations originating in the ear or its vicinity, and audible to others besides the patient; the second being audible to the patient alone, and usually due to irritation of the auditory nerve and its terminal expansion in the labyrinth. Objective noises, such as "crackling," "popping," and "splashing" sounds, are due to a voluntary contraction of certain muscles in yawning, swallowing, etc., and the drawing away, or sudden separation of the membranous portion of the Eustachian tube, unduly agglutinated by a catarrhal condition. Or to the bursting of an air bubble; or displacement of air by mucus in diseased conditions. "Splashing" or "rattling" sounds point to the existence of fluid in the middle ear, and certain "flapping" sounds, observable on shaking the head, may be attributed to this cause, or to a displacement of the auditory bones in atrophy of the ligaments sustaining them. The contraction of certain muscles of the middle ear is frequently attended by noises. Tonic or clonic spasm, may give rise to a drumming or buzzing sound in the ear, lasting for several minutes.

Subjective sounds with which we are more immediately concerned, may be divided into pulsating, hissing, blowing, rushing, bells, musical, and even the sounds of voices. Pulsating sounds, which are synchronous with the pulse, are for the most part vascular sounds having an arterial origin, as small aneurisms or varicose formations in the tympanum and labyrinth; also to the presence of secretion pressing on the small arteries; or there may be simple congestion, or preternatural fulness of the arteries in and about the temporal bone. The rushing, blowing, and hissing sounds, are by far the most common, and are mainly produced by catarrhal processes in the middle ear and Eustachian tubes, causing abnormal pressure on certain veins—the jugular vein for instance, which is located beneath the floor of the middle ear. A murmur in the ear may be produced, too, by thickening of the walls of this vein, independent of ear-disease. Any kind of pressure on the auditory nerve is received by the nerve centre in the brain as sound, just as pressure on the optic nerve is perceived by the brain as light (sparks). A familiar instance being a blow on the eye-ball producing "stars." The sound of bells, "ping" as it is described, means tension of the internal ear, and is one of the symptoms of Menière's disease, and nerve deafness. Many of these sounds are associated with a "nervous state," and in such cases, it will be found they are aggravated by worry and excitement, and lessened by moods of serenity. Where noises are caused by a shock, a fall, or loud noise, they are invariably due to the terminal expansion of the auditory nerve being thrown out of its position of equilibrium, and placed in a state of temporary or permanent irritation. Perforation of the drum is much less frequently connected with *tinnitus aurium*, than with deafness without perforation; this is partly accounted for by the better equalization of the outer and inner pressure of air, which is rendered more possible by a perforation; hence there is less pressure on the auditory nerve. Puncture of the drum may indeed give relief to the noises, but is not a remedy which can be indiscriminately practised.

The sound of voices, *i.e.*, when a patient imagines he is spoken to, or voices are heard mocking or repeating the patient's own speech, points to insanity, which may be accompanied by aural disease or not. Such hallucinations hardly come within the scope of this work, and should be a guidance and a warning to the patient's own friends to seek the highest medical advice without delay.

The character of ear-noises is extremely varied. Some patients find a difficulty in comparing them with actual sounds, and they employ terms or comparisons suggested by surroundings or occupations. The rushing sound of a waterfall; blowing off of steam; water overflowing into a fire; the shriek of a locomotive; buzzing, hissing, humming, crackling, and ringing, all come in for description. The twittering of birds, and rustling of wind among the trees, or the sound of telegraph wires in rushing along by rail; and in some cases there may be two different sounds together. Some patients localize the sound to one or the other ear, others cannot, but describe them as being in the head generally. Some suffer comparatively little annoyance from the noises, while in others the effect is so distressing and constant, as to render life a burden, forbidding engagements, and being a complete bar to social life or enjoyment, and driving hypersensitive natures to find relief in self-destruction. The relation of these sounds to deafness varies. There may be slight deafness with very distressing noises, or vice versa. Then, again, the hearing may be normal, and the noises severe. In a few cases the noises may proceed from reflex causes, such as from carious teeth, or a diseased condition of the naso-pharynx. Where, however, noises continue for a lengthened time without deafness, they may be regarded as a premonition of impending deafness. When deafness and noises are both very intense, they may both steadily increase till the deafness be complete, when the noises will suddenly cease, owing to complete loss of functional activity of the auditory nerve. If the hearing improve under treatment the noises may diminish, but no such favorable prognosis can be given beforehand in the majority of cases.

The treatment must be directed to the cause, whatever it may be. There is no actual specific against *tinnitus aurium*, and success will largely depend upon the nature of the cause, and its being recognized. When connected with disease of the auditory canal, such as furuncles, acute inflammation, or inspissated cerumen, cure is quick and lasting, as a rule. When associated with disease of the middle and internal ears—particularly the latter, treatment is much less effective, though much may be done in mitigation. Antiphlogistic measures must be persevered with. Warm baths, Turkish baths, hot mustard and water foot baths, saline aperients, are all useful. Rheumatic and gouty patients must have appropriate constitutional treatment. Counter-irritation behind the ear by blisters, or the application of the tincture or ointment of Iodine does good. A spirituous embrocation rubbed in over the mastoid may help. Thus:—

Lin. Saponis.
Lin. Camphor Co., of each, ½ oz. mix.

Painting the cartilaginous portion of the auditory canal with the following may answer, if excessive dryness of the canal exist:—

Tinct. Valerian,	1 drm.
Æther Sulph.	½ "
Glycer.	6 " mix.

The inflation of the ears with 10 drops of Iodide of Ethyl in a pint of hot water; the vapour to be drawn up the nose and driven into the ears gently; as recommended by Burckhardt-Merian, may be tried.

Treatment of any specific affection of the ears is indispensable, and also of the nose or throat. In some cases a warm instillation as the following, will be beneficial:—

Liq. Morph.	2 drms.
Glycer.	1 "
Pulv. Acid Boracic	10 grs.
Water to	1 oz. mix.

20 drops warm to remain in the ear 15 minutes.

Warm salt gargles often relieve. Regarding internal remedies, Chloride of Ammonium, Bromide of Ammonium, Chlorobrom, Hydrobromic Acid, and Bromide of Potassium, have all their special advocates; and where one is found to fail, the others may succeed in the following formulæ:—

Ammon Chlorid.	3 drms.
Tinct. Nucis. Vomic.	2 drms.
Sp Chlor	1 drm
Water to	6 oz. mix.

or :—

Ammon Bromid	1½ drms.
Tinct. Nucis. Vomic.	2 "
Sp. Chlor.	1 "
Water to	6 oz. mix.

or :—

Acid Hydrobrom dil	6 drms.
Liq. Strychniæ	36 m.
Sp. Chlor.	1 drm.
Water to	6 oz. mix.

or :—

Pot. Bromid.	120 grs.
Liq. Arsenicalis	36 m.
Tinct. Gentian. Co.	6 drms.
Water to	6 oz. mix.

All the foregoing can be taken twice or thrice daily, one tablespoonful in an equal quantity of water between meals. Chlorobrom may be taken in teaspoon doses, well diluted. Of the various drugs, Hydrobromic Acid is the most satisfactory, from its effect in contracting the labyrinthine vessels, and its counteraction against quinine. Lastly, should there be any hepatic disorder, a course of aperient waters may have the best effects. Such as Friedrichshall Bitter Water, Hunyadi Janos, Pullna, or Vichy. The following pill may be given for very obstinate cases:—

Zinci Valerian
Ext. Conii, of each 2 grs. mix.
Make a pill, and take one morning, midday, and evening, for 4 days.

The causes of *Tinnitus Aurium* have been a subject of contention among aurists for hundreds of years, and even now medical science has failed to clear up the matter satisfactorily. We may, however, regard it as a general symptom of nervous derangement, and any treatment, to be really serviceable, must review the state of the whole body; and appropriate medical, hygienic, and dietetic treatment employed. Electrical treatment was much vaunted at one time, but it has been found that many cases are made worse by over-stimulation of the auditory nerve, with this agent, and it should therefore be avoided.

The writer is acquainted with several cases, which under his care were making slow but steady progress, and which were made worse and rendered incurable by electricity. Much difference of opinion exists on the point among aurists, which probably is due to uncertain data. When hyperæsthesia of the auditory nerve with tinnitus exists, galvanic excitement will render matters worse; on the contrary, with torpidity of the nerve (dysæthesia) some benefit may result; but in the latter case noises are rarely intense or persistent, and in the former they are the worst symptom, and electricity is therefore inapplicable.

If rheumatism or gout exist, great relief will be derived from the following:—

Pot. Iod.	15 grs.
Vin Colchici	1½ drms.
Tinct. Hyoscyami	1 drm.
Inf. Calumb to	6 oz. mix.

$\frac{1}{6}$ thrice daily.

The late Mr. Harvey had great faith in Colchicum in these cases.

Two more remedies are here given which have worked almost miraculous benefit in some cases, to the writer's knowledge; while to others no good result follows, or the cases may even be made temporarily worse:—

Quiniæ Sulph.	24 grs.
Acid Hydrobrom dil.	3 drms.
Water to	6 oz. mix.

A tablespoonful in an equal quantity of water thrice daily.

or:—

Tinct. Ferri Perchlor.	2 drms.
Acid Hydrobrom dil.	3 „
Water to	6 oz. mix.

A tablespoonful in an equal quantity of water thrice daily.

Apart from local mischief, many incurable cases of tinnitus originate in altered conditions of the blood or vessels, as in anæmia of women; and there can be no doubt that many ill-defined morbid conditions of the blood act injuriously on the auditory nerves, as in uræmia, gout and rheumatism. In some people noises in the head alternate, or are associated with *muscæ volitantes* (spots before the eyes), and may be due to co-equal origin. Lastly, anything which by interfering with the return of the blood from the head creates venous stasis, will induce or intensify the noises.

CHAPTER XXIV.

DISEASE OF THE AURICLE.

Malformations of the auricle are usually due to non-development of the elastic cartilage, the result of intra-uterine inflammation, adhesion, etc. Such cases rarely call for surgical interference, although they are unsightly. Undue prominence of the auricle is of no importance unless it be due to disease of the mastoid process, in which case other symptoms indicate the seriousness of the case.

The reverse of this—flattening of the auricle—may be co-existent with collapse of the auditory canal, in which case some considerable deafness will be present, but the mere condition of flattening is of no importance.

Injuries of the auricle not unfrequently occur on account of its exposed position at the side of the head. At the same time, the elasticity of the framework is a protection against injuries. If, on the receipt of any injury, the skin be not at the same time divided, the blood becomes extravasated between the integument and the cartilage on the concave surface of the auricle, filling up its depressions, or causing the previously sinuous portions to appear as roundish elevations or swellings. Such tumours in recent cases exhibit an increase of temperature, and are generally developed in the upper half of the auricle. If the cartilage has been affected by the injury, characteristic changes in the shape of the part are apt to remain. Such deformity may sometimes be observed on the ears of pugilists, although a normal auricle is said to have great capability of resisting injuries of any sort. Such cases require to be treated on the common lines of practical surgery. Sebaceous cysts, or tumours, sometimes occur on the lobe, or concha. The simple evacuation of the contents with a hypodermic syringe, and the destruction of the secreting surface with tincture of iodine is sufficient to cure.

An auricle completely severed from the head, as practised in Oriental countries, may be made to re-unite, if the cut surfaces are at once brought into accurate apposition; but there is no appreciable loss of hearing power by such an amputation.

Gout is sometimes announced by a slight inflammatory and painful redness of the upper part of the auricle, and in people with arthritic diathesis, depositions of urates may be found on the lobe, accompanied by the most intolerable itching and warmth, or even numbness and torpor affecting the part. Garrod has called attention to the frequent occasion of uric acid depositions on the auricle, in persons of gouty tendencies, and such symptoms are of importance in the diagnosis of the disease, and one of the most common external symptoms. Local treatment is of little use, constitutional treatment being all-important.

Spontaneous Hæmatoma Auris, is a swelling on the auricle, spontaneously developed, principally in the insane; and it may attain the size of a walnut in a few hours. There seems to be, in the insane, a special tendency to effusion of blood in the tissue of the auricle with consequent shrinking, and some writers suggest the probability of a connection between the circulation in the brain and that of the ear, as accounting for these effusions in lunatics. They may also be the result of rheumatism.

Various skin diseases may attack the auricle, such as eczema, lupus, herpes, etc.

Eczema is the most common affection, both acute and chronic, dry or moist. It is not infrequently continued from the neighbouring parts, and is common in weakly, strumous children. In chronic cases the auricle may become thickened, and some deformity, with cracks and fissures, may arise. The auditory canal may also be swollen, and the passage narrowed or entirely closed. Eczema may also be caused by the local irritation of an ear-discharge, which may be infective, and full of micro-organisms, and is sometimes so acrid as to excoriate the parts over which it passes. In such cases, the discharge must be stopped before the eczema will yield to treatment. Unless the case be of long standing, suitable injections and ointments will effect a cure in a week or two; but there is a great tendency to return, in weakly subjects. Soap and water, milk and water, and undue friction must be avoided, and the following lotion will do good:—

Liq. Carbonis detergens	2	drms.
Liq. Plumbi dil.	1½	oz.
Acid Carbolic	15	grs.
Water	10	ozs. mix.

A tablespoonful added to an equal quantity of hot water, should be applied to the parts and also used to syringe the canal.

The following ointments are eminently useful:—

Ung. Hydrarg Oxid rub	1 drm.
Lanoline	1 oz. mix.

Or:—

Ung. Hydrarg Fort	1 drm.
Vaseline	
Ol. Amygdalæ of each	½ oz. mix.

A strictly anti-inflammatory diet with abstention from alcohol and sugar, and the administration of the following is necessary:—

Pot. Iod.	36 grs.
Liq. Arsenicalis	36 minims.
Decoct. Sarsæ Co	6 oz. mix.

A tablespoonful thrice daily after food.

Occasionally it is found that the ears stand out prominently; this may be remedied by a plastic operation: a piece of the integument, or even the cartilage, being removed from between the auricle and mastoid, and the edges united with fine horse-hair, and the parts compressed with a bandage.

Various other affections of the auricle arise from time to time, but, inasmuch as they come within the domain of ordinary medical practice and surgery, their description is out of place in a book of this nature; the principal point being to prevent any extension to the auditory canal, whereby the hearing power would be endangered.

Under the influence of intense cold, the auricle may be frostbitten in persons possessing a feeble circulation, and thereby actually destroyed. Gentle friction, and the application of ice-water is all that can be done at first, and the subsequent treatment continued on ordinary surgical principles.

CHAPTER XXV.

NARROWING OF THE AUDITORY CANAL.

Narrowing or collapse of the external meatus may occur in various degrees, in the bony, as well as the cartilaginous portion of the canal. It is found chiefly in elderly people, and in women more than men, and is caused by the approximation of the posterior to the anterior wall, produced by a too flaccid condition of the fibrous tissue and skin. The ontrance to the ear may thus be reduced to a mere slit. This condition, besides causing deafness by closure of the canal, interferes with the normal evacuation of cerumen; and accumulations form which greatly impair the hearing, and give rise to various reflex phenomena, such as nervous cough, giddiness, etc., and even to inflammation. Collapse of the meatus occurs in persons of advanced age, and is caused by a partial paralysis of the muscular fibre of the canal, and is more difficult to treat. Many people unknowingly suffer from this form of deafness, and are in the habit of improving the hearing by "raking" the ear with the finger, with an up and down motion, which acts by air pressure; the improvement is, of course, only temporary, and soon makes matters worse by impacting the wax in the inner end of the canal. The cure for this condition lies in the use of a small meatus tube, made of silver or vulcanite, about ¾ of an inch in length. At first it should only be worn a few hours at a time, lest inflammation be set up by its use. After a time, the patentcy of the canal will have become so improved, that the instrument may be dispensed with. Only in cases of collapsed meatus are these meatus tubes of any service, but the successful results arising from their use, in such cases, together with the fact that they are invisible when inserted, are the reasons that nearly every deaf person has tried them. The removal of any accumulations of wax is required when the canal has been properly dilated.

Contraction of the meatus may also occur as an after result of eczema, furuncles, etc.; which cause a thickening of the cutaneous lining of the canal. This may be treated by the insertion of oblong plugs of wool, dipped in nitrate of silver (40 grs. to the oz. of water) and left in the ear 2 hours, then withdrawn and another plug inserted smeared with vaseline, and changed morning and night for 3 days; the nitrate of silver again to be used for 2 hours. Or a cotton wool plug smeared with a stimulating ointment may answer better:

Hyd. Oxid rub	
Hyd. Ammon of each	3 grs.
Ol. Olivæ Opt.	1 drm.
Adip Benzoat	½ oz. mix.

Some sensitive ears will not tolerate the presence of a hard substance such as a meatus tube; such cases may be better treated by the insertion of a sponge "tent", *i.e.*, a piece of sponge ¾ of an inch long, cut like a piece of pointed slate pencil and pushed down the meatus as far as possible, after being smeared with dilute mercurial ointment:—

Ung. Hyd. nit.	1 drm.
Vaseline	
Ol. Amyg., of each	½ oz. mix.

CHAPTER XXVI.

INFANTILE AURAL CATARRH.

The frequency of ear-disease in children is very great. Ear-ache and discharges are always occurring, depending upon inflammation of the middle ear, caused by various troubles incident to childhood. Nasal catarrh and obstruction, dentition, and zymotic disease, all tend to produce ear troubles, which unless promptly treated may become chronic. Scrofulous children are very subject to aural disease; one of its most prominent symptoms being swelling and pain in the glands of the neck. Scrofula is mostly hereditary, sometimes skipping one or two generations in the absence of predisposing causes. One of the greatest mistakes made in this connection, is the belief that children will "grow out of it," and although spontaneous cure does and may occur, still, it is unwise to depend upon it. Early and appropriate treatment is always a necessity if the hearing is to be preserved. The spread of even mild inflammation from the nose, throat, and neck to the ears, will cause a lifelong impairment if left to itself. Naturally, there is difficulty in diagnosing aural troubles in children, but it is important to note that the cry of pain from a child with an ear affection is peculiarly piercing, and long continued; while the cry of pain from other parts, is moaning, fractious, and intermittent, especially in lung troubles. If one ear is affected, the child will cry the more when laid on that side, and movements of the head will increase the pain. Cold and noise also increase the painful symptoms, which are lessened by warmth and quietness. If pain in the ear be. suspected, the ear should be filled with very warm water, poured in from a warm spoon, and warm flannel tied round the chin so as to cover the ears. Poultices are not advisable. In addition, the passing of a flexible feather dipped in simple ointment, or almond or olive oil, down both nostrils, will give relief. As, also, the device described in Chapter XIII, of inserting a piece of india rubber tubing in the nostril and blowing with the mouth. If a discharge from the ear occur, it must be kept scrupulously clean by constant syringing with warm water, to which a teaspoon of glycerine of borax may be added. These remedies apply to very young children, but those of older growth (3 years and upwards) may have the nostrils syringed as described in the chapter on adenoid vegetations, and the ear filled with anodyne solutions as given in the chapter on ear-ache. The wet-pack to the neck, and warm baths, and transference to a warm blanket without drying, have a remedial effect, which is soon apparent by the quiet and easy condition of the sufferer. Cod-liver oil, with or without the addition of Iodide of Iron, and Extract of Malt (Keplér's) is very essential for weakly and strumous children, as also is the preparation, Bynol.

There is a prevailing custom among medical practitioners, as well as parents, to ascribe too many of the troubles of the first period of life to the process of dentition; but, as the famous Von Tröltsch remarks, " it does not appear likely that a physiological process for which Nature makes proper preparations, and which goes on with few local and sudden changes, should constantly lead to such pronounced constitutional disturbances " ; and he suggests that the frequency of ear-affections in very young children, as compared to the non-frequency of eye-affections, is due to an arrest of a certain physiological process commencing at birth, whereby the middle ear of the fœtus (which is filled with a cushion-like mass of mucous membrane), is gradually diminished by the respiratory process through the action of shrinkage and desquamation, and replaced by air. Arrest of this process induces inflammation, with all its train of painful consequences, and such an interference, with a nutritive process, is always more easily productive of trouble in parts undergoing metamorphosis and evolution.

Lucae goes further, and states positively, that pathological processes in the organs of respiration will readily lead, in young children, to abnormal conditions of the middle ear; in which case, a mere cold on the chest, to which children are so prone, will exert its reflex action on the ears. These facts are worth bearing in mind.

Whatever form an infantile ear-trouble may take, the writer cannot too earnestly impress on all concerned, that the earlier aural affection in children receives proper attention, the less likelihood there will be of disorders of the auditory apparatus in after life.

CHAPTER XXVII.

REMOVAL OF THE TONSILS.

This is a much disputed question. In very few cases (according to Harvey) does removal of the tonsils improve the hearing. If difficulty in swallowing (dysphagia) occur, or interference with respiration (dyspnœa), the operation is undoubtedly indicated. Enlarged tonsils cannot, considering their position, directly block the Eustachian tubes, but they may, by pressing upwards the surrounding tissue, interfere with the proper ventilation of the tympanum, and thus cause dullness of hearing. A strong hereditary tendency to enlargement of the tonsils due to struma, may exist, or repeated attacks of tonsillitis may cause the trouble. Again, zymotic disease may produce this condition. The enlargement may date from infancy, develop during childhood, or occur at puberty; and as a rule, the tonsils atrophy in adult life.

The appearance of children suffering from enlarged tonsils is very much the same as those suffering from adenoids—the open mouth, vacant expression, laboured breathing, sleeping with open mouth, and deafness may all be present; the deafness being due to thickening of the mucous membrane of the Eustachian tube. In the majority of these cases, adenoids will be found to co-exist, when the mere removal of the tonsils will do comparatively little good. Where, for certain reasons, the tonsils are not removed, painting with astringents may be tried, and will often do much good. "Swabbing" them with Glycerine of Tannic Acid will cause a shrinkage; also rubbing in powdered alum. Chloride of zinc will have much the same effect, and the following is most useful as a "swab":—

Tinct. Iodi
Tinct. Catechu
Glycer., equal parts. mix.

The syrup of Iodide of Iron in teaspoon doses thrice daily is beneficial.

All ideas as to interference with the sexual function by removal, may be dismissed as groundless. A "swab" can be made by tying a piece of sponge to the end of a stick, and answers better than a brush.

It has to be remembered that the removal of the tonsils in a singer will alter the tone of the voice, and children upon whom the operation is performed, often develop as a result a somewhat thin tone, deficient in resonance, which spoils the voice for public singing.

CHAPTER XXVIII.

FOREIGN BODIES IN THE EAR.

FOREIGN bodies sometimes become lodged in the auditory canal, mostly in children and hysterical females, and may become a source of discomfort, not to say danger; and form a nucleus for an abnormal collection of cerumen, etc. They may be divided into three classes: (1). Those that swell and enlarge from heat or moisture, so becoming more firmly impacted, and a source of serious irritation and danger; such as peas, beans, seeds, berries and the like; (2). Those that irritate, but do not enlarge do any extent; such as insects, pieces of wool becoming putrescent; (3). Those bodies that do not enlarge, and which may not be liable to irritate; such as beads, small stones, pieces of slate pencil, wood, etc. In whatever way they are introduced, the kind of phenomena called forth by their presence, depends upon the size, shape, and chemical and mechanical nature, and the force used in pushing them into the ear. For instance, a small, smooth, round body may remain in the ear for years without exciting any trouble or causing any deafness. But if the object be large, and pressed in deeply with force, either at admission or by subsequent attempts at extraction, serious consequences may result.

The first thing is to make sure that there really *is* a foreign body in the ear, for it must not be forgotten that a form of monomania exists in a few people, who imagine there is something in the ear when there is not. It is very hard to convince these patients that they are mistaken, for they refuse to believe even the aurist who has made a proper examination of the ear. Such cases (happily rare) may be classed as an hysterical affection of the ear, and may be cured by humoring the patient, by pretending that the object which they believe to be in the ear, has come away by syringing, and is shewn to them in the basin; then any abnormal sensation which gives rise to the delusion may be relieved by dropping in an anodyne solution.

As a rule, lay interference with the ear is to be deprecated, for such well-meant attempts to extract anything from the ear usually make matters worse. The exceptions are:—If any object described in Class 1 can be seen, a slender brush with the hairs cut short and even, may be tipped with strong glue, and applied so as to well embrace the object, and left in for twenty-four hours to dry and adhere, when the body may be drawn out; the quill should be cut level with the orifice of the ear, and wool packed round it to keep it in position. This may fail, but its simplicity and harmlessness are recommendations. Syringing with water should not be practised in this class, for irrespective of the fact that the stream of water may drive the object further in, it is obvious that such objects will swell from absorption of moisture, and thus render extraction doubly difficult; but syringing with clear olive oil does not possess such disadvantages, and in addition, instillations of warm glycerine may be used, for it has been proved that glycerine will cause such objects as are liable to swell with water, to actually shrink, hence the subsequent injection of the olive oil would have greater effect in dislodging them. Class 2 presents no great difficulty, as wool may easily be syringed out, and insects may be killed by filling the ear with a teaspoonful of warm water containing a few drops of carbolic acid, or inserting a piece of wool dipped in a little chloroform, followed by syringing; or tobacco smoke may be blown into the ear which will cause the insect to make a speedy exit. Fleas, bugs, and flies, may enter the ear, and country people are occasionally tormented by various insects crawling in. A flea may cause pain and tinnitus by jumping about, and a bug may fasten upon some part of the canal or drum-head, and cause severe pain. The earwig (*forficula auricularia*), so much dreaded, may enter the ear, but the foregoing remedies will suffice to dislodge even this "enemy within the gates." Of greater importance and difficulty to bring away, are flies (*muscida sarcophaga*), which develop larvæ and maggots; their expulsion is not so easily effected. A strong solution of chlorinated soda, or rectified spirit, must be soaked in the ear in order to kill them, then the syringe will bring them away, but several attempts may be required.

Objects comprised in Class 3, may, in most cases, be expelled by syringing with soap and water, or with clear olive oil, and at the same time, the ear should be inclined downward, so that by making the floor of the auditory canal an inclined plane, and bringing into play the action of gravity, the movement outwards of the offending body may be facilitated.

Failing these simple attempts, recourse should be had to a specialist, for an ordinary practitioner seldom possesses the necessary instruments for difficult removal. If the object should have passed beyond the isthmus, *i.e.*, the narrowest part of the canal, removal is exceedingly troublesome, and it is just this complication that the well meant, but blundering efforts of friends brings about. Peculiar reflex phenomena, such as cough, giddiness, fainting, vomiting and sneezing may be set up by foreign bodies in the ear, explainable by the irritation exercised upon the numerous nerve twigs distributed in the cutaneous lining of the auditory canal and drum-head. Many ingenious methods have been devised for extracting foreign bodies from the ear, but as they are useless in lay hands, no purpose is served by describing them. There is no danger of anything, alive, or inanimate, getting to the brain, as feared by so many people, the worst results being pain, deafness, and fright.

Most of the evil consequences occurring in these cases are the results of unskilled treatment and fright, and it should be remembered that a foreign object in the ear does not necessarily mean danger to life or hearing. Many adults have discovered hitherto unsuspected substances in the ear, which must have been introduced in childhood, and have remained many years without doing any harm. The evil arises from the unrelenting fury with which a foreign body in the ear is followed up, as if life itself depended on immediate extraction.

CHAPTER XXIX.

SECRETIONS OF THE AUDITORY CANAL.

The secretion of cerumen may be deficient or excessive in quantity.

Diminished Secretion is mostly seen in people past middle life and is connected with many diseases of the middle ear, as well as the secretory power of the skin, the cutaneous lining of the auditory canal being a continuation of the common integument, retaining all its fine and coarse anatomical peculiarities; and it is usually those persons possessing a harsh, dry skin, with little fat, who are most liable to defective secretion of wax, because the *glandulæ ceruminosæ* share in the inactive condition of the sudoriparous glands of the general integument. In people suffering from dry catarrh of the middle ear (sclerosis), the canal is found unusually dry, being destitute of the natural emollient, and also abnormally wide. An artificial condition of dryness may, however, be induced by constant syringing, which sets up a morbid drying and indurating process in the canal.

This condition may also be a characteristic of chronic rheumatism; and be caused by excessive cold bathing. If deficient secretion co-exist with deafness, it must be remembered that the deafness is not a result of the dryness of the ear, but the dryness is simply a symptom, which might be bettered by alleviation of the middle ear trouble with which it is associated.

The symptoms are: uncomfortable dryness in the ear, with dry rustling sounds during mastication, and sometimes a dull and heavy head sensation. The canal presents a clean polished appearance, and the throat is also dry and harsh, as a rule. The treatment should consist of painting the canal with vaseline, or with equal parts of almond oil and glycerine; and although this may not encourage a more active condition of the ceruminous glands, it will, at least, relieve the discomfort of the harsh dryness so much complained of. The skin generally, should be stimulated by warm salt baths, Turkish baths, and the like; and congestion of the alimentary canal avoided.

Excess of Cerumen. This may be due to (1) an overactive condition of the ceruminous glands; (2) To collapse of the auditory canal, or an unusually curved formation of the canal; (3) To impaction of the wax, by "screwing out the ears" with the corner of a towel, or using aurilaves, and thus forcing in the secretion. A bushy growth of hair at the entrance of the ear, seen in some elderly men, will also cause an accumulation, by obstructing the exit of the wax. The wax, too, may be altered in character, though actually diminished in quantity, this altered character interfering with its due exit. Various other explanations have been given by different writers; one being that inspissated cerumen is a symptom of an inflammatory condition of the lining membrane of the canal, or of the middle ear, which has extended to the canal, and the ceruminous glands lying beneath the cutis are made to sympathise, as manifested by increased secretion. Efforts made to fastidiously cleanse the ear often result in the opposite effect—accumulation; for the healthy auditory canal is fully able to take care of itself, and is the one part where strict cleanliness is not desirable; and "aurilaves," probes, ear-spoons, and such like instruments should be avoided. A plug of wax is commonly made up of cerumen, epidermic scales, hairs, or inspissated pus, and it may attain such a degree of hardness as to merit the description "petrified": the colour and consistence will vary in different individuals. If an accumulation once form, it is likely to recur from time to time, and will require periodical removal.

The masses go on forming during a long period of time, without inconvenience, provided no pressure on the drumhead occurs, and a small gap exists in the mass, but once this becomes occluded, sudden and intense deafness will supervene, which may fluctuate as the plug is shifted by the movements of the jaws. Giddiness and tinnitus are set up, and a "stopped up" feeling is invariably complained of. Even mental disturbance and hallucinations may take place. Pain is more rare than a feeling of pressure.

From the foregoing, it will be evident that the extraction of the plug must be carried out with patience and care, out of consideration for the deeper parts of the ear, for the degree of hardness and intensity of the mass may be such as to require considerable softening before a stream of water will have any effect; and the tenacity with which it will adhere to the sides of the canal, renders forcible measures dangerous. The first thing to do, is to make sure a plug really exists, for it is still necessary to protest against the indiscriminate and empirical use of the syringe, even by medical practitioners. Various solutions may be used as a softening agent; the ear should be filled with the warm solution at bed-time, and the patient may sleep on the unaffected side, and the syringe used in the morning. This may have to be repeated several times before the whole mass is brought away. In slight cases the softening solution may be left in the ear ten minutes at night, followed by the syringe.

The following solutions can be used:

Sodii bicarb.	1 drm.
Glycer.	1 drm.
Ac. Carbol	2 grs.
Water, to	3 oz. mix.

or:—

Liq. Morph.	
Glycer., of each	1½ drms.
Pulv. Ac. borici	10 grs.
Water, to	1 oz. mix.

or:—

Pulv. Ac. Salicyl	15 grs.
Sp. rect.	1 drm.
Glycer. boracis	½ drm.
Water, to	1½ oz. mix.

All must be used warm. The injection may consist of plain warm water, or water containing a teaspoonful of glycerine to a wineglass of water, and the stream should be directed to one or the other side of the collection to detach it from the sides of the canal, when the water will probably pass behind it and sweep it out as a whole. In some cases the collection will come away gradually in the form of fine sand, or in flakes. The canal may be straightened by drawing the auricle slightly upwards and backwards, to favor the ingress of water and egress of the wax. After removal the ear must be protected by the insertion of a loosely drawn out piece of cotton wool, as the temperature of the canal may be so heightened by impacted wax, as to render the ear extremely sensitive to cold after extraction, for a few days. As a result of syringing, the ear may be inflamed and painful, when an anodyne or soothing ointment should be applied on the wool:

Morph. Acetat.	4 grs.
Vaseline	½ oz. mix.

The ear may also be inflated after removal, to restore the drum-head and ossicles to the right position, and relieve any existing tinnitus. On first using the ear-drops, a marked increase in all the symptoms may occur, which is due to swelling of the mass by absorption of moisture; it is necessary to mention this, as some patients would discontinue the remedies on finding themselves worse.

In most cases only a moderate quantity of ear-wax is secreted, which covers the cartilaginous meatus as a thin layer. The superficial portion gradually becomes dry, and is lost through the motion communicated to the cartilage of the canal by the articulation of the lower jaw, and also in lying on the ear at night. A too vigorous secretion must be periodically removed. Inspissated cerumen is characteristic of people who perspire easily, and is common among gardeners, carpenters, labourers and railway men, etc., who pass many hours in the sun. The ear-wax plays an important part in the human economy, and those who are so eager to rid their ears entirely of it, should remember that the auditory canal is naturally smeared with wax as a protection to the ear against insects and morbid growths, the wax being bitter to the taste, and glutinous in character, as a protective provision of Nature; and the "ceruminous circle" exists in the *meatus externus* as a sign of health, and is looked for in every examination of the ear, as a means of forming a reliable diagnosis in ear-affections. Ear-wax may be compared to the lachrymal fluid which moistens and cleanses the eye, and the one is as necessary as the other to perfect health of the respective organs. It may be repeated that ear-wax if left alone will work its way out of the ear, but if it be pushed inwards by attempts at cleansing the ear, it is forced past the isthmus of the canal, and gradually enlarges, forming a nucleus for additional deposit of dirt, skin scales, and more wax. In the majority of cases, this is the origin of inspissated cerumen.

CHAPTER XXX.

BOILS IN THE EAR (FURUNCULOSIS).

This is a very painful affection of the auditory canal, having its origin in a gland or hair follicle in the subcutaneous tissue of the cartilaginous part of the canal. The same conditions which produce boils in other parts will produce them in the ear, and in the majority of these cases some constitutional abnormality exists, needing treatment. They may be found in the poorly fed, or the *bon vivant*, and mostly affect people leading sedentary lives; and women are prone to them at the climacteric period. The disorder does not usually terminate with a single boil, but there may be a succession of them, due, as discovered by Löwenberg of Paris, to their parasitic origin; a microorganism of the family *micrococci* invading a hair follicle and setting up the characteristic inflammation. The symptoms are sudden and intense pain, swelling and tension of the canal, with deafness, and increased pain on moving the jaws, due to the close relation between the auditory canal and the articulation of the lower jaw. The amount of pain, too, will depend upon the situation of the boils; when at the orifice of the canal little pain is felt, but when arising near the osseous part of the canal, the most unbearable pain is set up. There may be fever in severe cases and in irritable systems.

Relief follows in three or four days on rupture of the boil, followed by several drops of yellow pus; or the inflammation may subside without rupture. When the pain first occurs, warm anodyne instillations should be used, and repeated, and a hot flannel placed over the ear.

Morphinæ	3 grs.
Glycer.	1 drm.
Water	1 oz. mix.

And this may be continued till suppuration occurs, when the ear should be gently syringed with:

Liq. Morph.	
Liq. Plumbi Subacet of each	½ oz.
Water, to	10 oz. mix.

A tablespoonful in a wineglass of hot water; followed by the insertion of a longish piece of cotton wool dipped in:

Morph. Acetat.	4 grs.
Vas alb	½ oz. mix.

This will prove sedative. When the discharge has ceased, the auditory canal should be painted twice daily with:

Ung. Hydrarg. Nit.	½ drm.
Vaseline	
Ol. Amygd, of each	½ oz. mix.

This will prevent a return of the boils, by destroying the micro-organisms. The general health will require attention, and the tendency to boils may be reduced, as well as a prevailing attack cut short by the following pill:

Calcii Sulphid	¼ gr.

Make a pill. One thrice daily.

Incision of the boil before rupture, and the use of poultices, are generally advised, but these measures may fail to cut short the attack, and the use of poultices is sometimes provocative of granulations, and inflammation of the drum-head. Warm anodyne and anti-septic applications are more useful. A blister behind the ear may do good, but it must be remembered that once a boil occurs, it will have its fling more or less. Boils are similar to the "styes" on the eyelids, and as recurrent. As a sequela of boils there may occur an eczematous affection of the canal, with the formation of epidermic flakes and masses, which block the canal, adhering to its sides so tenaciously as to defy the syringe alone, requiring soaking with alkaline lotions such as:—

Sodii bicarb.	1½ drms.
Pulo Ac. borici	1½ „
Glycer.	1 drm.
Rose water	3 oz. mix.

To be used with equal parts of hot water.

If after removal the canal feel sore, the dilute mercurial ointment, as above, may be applied.

CHAPTER XXXI.

OTITIS EXTERNA.

This is an inflammatory process affecting the cutaneous lining of the canal, and it may involve the outer layer of the drum-head, and even cause perforation. In severe cases the middle ear cavity is involved; and on account of the intimate connection of the skin and periosteum, the osseous portion of the canal may participate, and polypoid granulations result. The causes may be zymotic disease; furuncles or eczema; in the latter case, the trouble is excited by the insertion of probes, etc., used to relieve itching in the canal; the effect of cold liquid entering the ear as in bathing or washing; irritating injections, and caustic applications. Reflex causes may exist, such as dentition, and getting the feet wet or cold; and a diphtheritic inflammation may occur, though rarely.

The symptoms are itching, with a feeling of heat, then pain in the canal, tenderness on pressure, deafness, swelling of the canal, which may become entirely closed, and discharge. The deafness varying with the amount of swelling and discharge. Pain may also radiate from the ear over the side of the head, so the cheek bones are painful to touch, and the jaw painful to move. The treatment should consist in soothing instillations and injections, such as those given in the chapter on boils, together with counter-irritation behind the ear, such as a small mustard leaf; and when the more acute symptoms have passed away, the following instillation will do much good.

Zinci Chlorid	1 gr.
Ac. borac pulv.	5 „
Tinct. belladon.	½ drm.
Water	1 oz. mix.

20 drops warm to remain in the ear 10 minutes, 3 times daily.

Warmth, by means of hot flannel or bran poultices, gives considerable relief, and soothes the ear, but moist poultices should be avoided, as they tend to cause ulceration and perforation of the drum-head. The prognosis is favorable, and usually complete recovery occurs in two weeks, if the drum-head and middle ear are not involved. Should the discharge continue in any degree after the acute symptoms have been arrested, it may be entirely stopped by blowing in the ear powdered boracic acid.

Improperly treated or neglected, this form of inflammation may develop the chronic stage, when the middle ear will be involved, and the so-called "otorrhœa" set up, which may last for years, or even a lifetime. The discharge then assumes an acrid character and disagreeable smell; granulations and polypi may form, the drum-head become thickened, glandular enlargement in the neck set up; and in fact, all the sequelæ of chronic inflammation induced, which is so difficult to overcome and which requires the most persevering treatment. This should consist in cleansing the ear daily with an astringent and antiseptic solution such as:

Glycer. Acid Carbol
Glycer. Acid Tannici of each 2 oz. mix.

1 teaspoonful to a wineglass of warm water. The ear to be carefully dried, and the following drops used:—

Zinci Sulph.	8 grs.
Acid Carbol Cryst.	4 „
Glycer.	1 drm.
Water, to	2 oz. mix.

20 drops warm to remain in the ear 10 minutes, followed by the insertion of absorbent cotton wool, or some boracic acid may be blown into the ear, before the wool is inserted.

It is important to re-itorate two warnings, given elsewhere in this book, in treating this disease—to avoid milk and water injections; and to avoid bathing unless the ears are protected by the insertion of oiled wool. Both these practices may cause a very serious exacerbation of the inflammation. The complaint has been named catarrhal inflammation of the meatus, but this is a misnomer, inasmuch as catarrh can only attack a mucous membrane, and the canal is lined with epidermis. An aperient should be taken at the beginning—blue pill is as good as any—and bark and iron tonics will do good, or the following:

Pot. Iod.	1 drm.
Ferri et Ammon Cit.	2 drms.
Inf. Calumb to	6 oz. mix.

A tablespoonful in water thrice daily.

CHAPTER XXXII.

AURAL CATARRH.

Catarrh of the middle ear may be simple or purulent, and each of these varieties may be divided into acute and chronic. Aural catarrh combined with perforation, or thickening of the drum-head, is answerable for the most frequent and incurable cases, and the inflammation which causes it principally, originates in the nose and throat, extending along the Eustachian tube to the middle ear; and it may involve the whole auditory apparatus, by continuity of tissue.

An accurate classification of inflammatory affections of the middle ear is difficult to carry out, for although there are certain types, they do not all conform to these types;

and a beneficial form of treatment can only be decided on by a just appreciation of the pathological changes occurring in the middle ear. Bearing in mind that the drum-head is externally continuous with the auditory canal, and internally with the mucous membrane of the middle ear, it will be seen how the drum-head will inevitably participate in the pathological changes of either part, although inflammation may commence in the drum-head itself, but more rarely. The middle ear contains, besides mucous membrane, the auditory bones, ligaments, minute articulations, synovial membranes, and an extensive supply of blood-vessels, and nerve-filaments; therefore the effects of inflammation in such a cavity, bordering, too, on the brain structures, can be easily imagined. If the inflammatory process is not sufficiently violent to destroy these middle-ear structures, and judicious treatment be promptly carried out, the hearing will not be lastingly affected; but in chronic and neglected cases, more or less destruction occurs, and subsequent organisation and fibrosis, with calcification, adhesions, and thickening will take place, and the hearing be irremediably impaired or destroyed. Inflammation of the middle ear is that of mucous membranes generally, but intensified by the reflected effects of occurring in so confined a space as the tympanic cavity.

ACUTE NON-SUPPURATIVE CATARRH (*otitis media*), without discharge, is usually the cause of ear-ache in children, which is commonly ascribed to neuralgia; the symptoms are deep-seated pain, throbbing or fulness of the ear, more or less deafness, tinnitus and feverishness. The ear and its neighbourhood are tender to the touch. Usually only one ear is attacked. The mucous membrane of the middle ear is in a state of congestion, swelling, and hypersecretion. Pain is aggravated by coughing, swallowing, blowing the nose, etc. The causes are cold, fevers, teething, or other dental irritation, and the injudicious use of nasal injections, when the fluid may enter the middle ear and set up inflammation. Predisposing causes are former attacks, naso-pharyngeal catarrh, and sometimes the entry of water through an old but quiescent perforation of the drum. The course will last from 4 to 7 days, when the pain may pass away, simply leaving a dull heavy feeling in the ear, and some degree of deafness. The treatment should consist of warm anodynes as advised in the chapter on ear-ache. Hot bran bags may be applied, but poultices should be avoided for fear of inducing ulceration and perforation of the drum-head. Stimulating applications as alcohol, eau-de-cologne, laudanum, etc., should not be used, as they will aggravate the trouble. An aperient should be given, and the skin excited to action by warm baths or diaphoretics, for they often abate an inflammatory attack of the ear; the naso-pharynx should receive attention, and the ear should be gently inflated by Valsalva's method. A good diaphoretic for a child is a dose of Dover's Powder; for an adult the following:

Liq. Ammon Acetat	1½ ozs.
Sp. Ætheris Nitrosi	80 minims.
Aq. Camph. to	4 oz. mix.

Dose: ¼ every 4 hours, for 4 doses only.

Those persons who suffer from periodical attacks usually become more deaf as time goes on, and in these cases, a predisposition to the trouble exists which hardly any treatment will overcome, the chief thing being to take each attack in time. If the inflammation and secretion be very great, the drum-head will yield, rupture and discharge occur, and the case becomes one of acute suppurative catarrh, although all cases of *otitis media* are not necessarily associated with suppuration, provided energetic and early treatment be adopted, and the fibrous portion of the drum-head be sufficiently strong to resist the pressure and suppuration. It is an unfortunate fact, that every person who has once suffered from sub-acute aural catarrh is liable to another attack, hence additional care of the ear will be required.

Acute Suppurative Catarrh is a development of the foregoing condition, the symptoms being the same but more intense, and the pain more acute until rupture and discharge take place, when great relief is experienced. The rupture may occur in a few hours after pain is set up, or after it has lasted several days. The Eustachian tube being closed by the inflammation proceeding from the naso-pharynx, the pus accumulates in the drum-cavity, and having no other outlet bursts through the drum-head, hence the rupture.

In children the drum-head is normally thicker than in adults, and therefore offers longer resistance to the pent-up secretion, but on the other hand the Eustachian tube is wider in children, and more favourable for the escape of the secretion into the pharynx; and to this may be attributed the more frequent recovery of children with less damage to the middle ear. When discharge occurs, it may last from 4 days to 2 weeks, before cicatrization takes places, and the most important item of treatment should consist in removing the discharge as fast as it forms, and keeping the ear clean and warm. Neglect to do this may set up a chronic discharge (Otorrhœa) and may prove the annoyance of a lifetime, and lead to serious deafness. Neglect of cleanliness will convert a small slit-like perforation into a round hole with callous edges, which never heals, and perforative otorrhœa with all its accompanying horrors is induced. If pain still exist when the discharge appears, the ear should be gently syringed with the following solution:—

Liq. Plumbi subacet	
Liq. morph.. of each	½ oz.
Water, to	10 oz. mix.

A tablespoonful to a wineglass of warm water.

If the discharge be copious but no pain exist, either of the following may be used as an injection:—

Acid Carbol	30 grs.
Glycer.	½ oz.
Sp. vini rect.	2 „
Water, to	1 pint mix.

Half fill a wineglass and fill up with hot water.

or:—

Zinci Sulph.	½ drm.
Glycer.	1½ oz.
Water, to	10 oz. mix.

A tablespoonful to a wineglass of hot water.

In each case the ear should be filled with the diluted lotion, and inflated several times, as well as syringed in the ordinary way; this will bring the solution into contact with the middle ear. As the discharge lessens the ear need only be syringed with warm water, carefully dried, and the following solution dropped in warm:—

Zinci Chlorid	1	gr.
Pulv. Ac. borac.	5	"
Tinct. Belladon.	½	drm.
Water, to	1½	oz. mix.

20 drops warm to remain 5 minutes twice daily; the ear to be dried, and pulverized boracic acid blown in, and retained with a piece of wool.

A blister behind the ear gives considerable relief to the acute symptoms. Here again, the naso-pharynx will require attention, and any of the nasal solutions already given will prove beneficial, as well as the use of antiseptic ointments. When acute inflammation comes on in an old diseased ear, cerebral complications such as meningitis may always be feared, hence the importance of depleting the system in well nourished subjects, and to some extent even in children. As a result of recurrent cases of non-suppurative and suppurative aural catarrh, a chronic condition of the middle ear is set up, which is very destructive to hearing power, unless treatment be regularly carried out, as described in the Chapter on Chronic Aural Catarrh.

CHAPTER XXXIII.

MYRINGITIS.

THE comparative rarity of inflammation of the drum-head alone, has led many aurists to deny its possible existence, but the writer has seen and treated two such cases. It is an inflammation of the fibrous (middle) layer of the drum-head, and may trouble people of gouty or rheumatic tendencies. The symptoms are deafness, acute pain at the inner end of the auditory canal, coming on suddenly like tooth-ache, with a sense of fullness in the ear, and subsequently a very slight discharge; the middle ear and auditory canal do not participate, or if so, to such a slight extent, as to call for no special treatment. The drum-head appears dull, and in some cases assumes a blackish or coppery appearance, and there may appear small swellings on the upper portion. In mild and superficial cases the pain is slight and transient, but if an abscess form in the fibrous structure, the pain will be intense and unbearable. The epidermic (or outer) covering of the drum-head is ultimately thrown off on subsidence of the more acute symptoms, and may come away in the form of a perfect cast of the drum-head, but more often, it comes away as sodden flakes, and after the hyperæmia and swelling have subsided, the epidermis re-forms. Perforation may take place, and then the middle ear is involved, but this is not usual in simple cases. A permanent thickening of the drum-head may result, but this will largely depend on right treatment. An anodyne instillation will relieve the pain, also hot dry flannel over the ear, but if poultices are applied the worst effects ensue, and the drum-head may be so ulcerated as to be entirely destroyed. The following solution should be dropped in warm :—

Ext. opii liq.	3 drms.
Glycer.	1 „
Liq. Plumbi dil.	1 oz. mix.

The ear should on no account be syringed until a discharge occur, and even then, this operation must be very gently performed. Wool should be worn, and rest and quietness observed. When the pain has subsided, as it may without discharge, then the ear may be gently syringed once, to remove accumulated *débris*, and the following drops used warm :—

Zinci Chlorid	1 gr.
Ac. borac. pulv.	5 „
Tinct. Belladon.	½ drm.
Water	1½ oz. mix.

Improperly treated, or neglected, or the causes (cold, etc.) continued, the chronic form will supervene, and give great trouble from its intractable nature. There is less pain, but more deafness ; and a continual sense of moisture in the canal, with a bad odour, leading to permanent thickening and rigidity, or to perforation. The treatment then becomes that of chronic suppurative disease. In both the acute and chronic forms the use of Iodine ointment rubbed in behind the ear, will do considerable good. Blowing the nose violently, sneezing, &c., must be avoided, to prevent rupture of the drum-head, and although inflation is admissible when the acute inflammatory symptoms have abated, it must on no account be performed at the early stages of the trouble, and never violently.

CHAPTER XXXIV.

CHRONIC AURAL CATARRH (NON-SUPPURATIVE).

This is one of the most common causes of incurable deafness, and it becomes less amenable to treatment as time goes on. As before stated it is difficult to classify cases of aural catarrh, but it should be borne in mind that the distinguishing feature of this phase of deafness consists in thickening and effusion in the middle ear, with anchylosis of the auditory bones, and adhesions; these conditions spreading to the fenestræ, thus setting up secondary nerve deafness. Repeated slight attacks of deafness will induce progressive loss of hearing, and these cases always originate in the nose and throat. Enlarged tonsils, adenoid growths, hypertrophic rhinitis, polypi, and deviations of the septum of the nose, all contribute to bring about chronic aural catarrh, which is commonly intensified by neglect of the earlier symptoms. Simple relaxed catarrh with hypersecretion and swelling is more characteristic of early life; while dry catarrh with atrophy of the mucous membrane, and little or no secretion, belongs more to advanced age or those past middle life. Every variety of catarrh may be hereditary — "run in families," as the saying is, and the more marked is the evidence of naso-pharyngeal abnormalities, the more certain will the middle ear mischief depend upon, and be caused by such conditions. The Eustachian tube is early affected, and the valvular arrangement by which the supply of air to the middle ear is regulated may be thrown out of gear, or the tube may be entirely obstructed. The consequence is, the drum-head is in a condition of extreme retraction or depression, due to absorption of air in the tympanic cavity, and the failure of a fresh supply through the Eustachian tube. The middle ear thus becomes a vacuum instead of an air chamber as designed by Nature, and the drum-head instead of lying between two strata of air of equal density, is pressod inwards by the outer pressure of air being greater than the resistance in the drum cavity. Inflation produces a temporary reversal of these conditions, with consequent temporary improvement to the hearing, as, where the valvular arrangement of the Eustachian tube is affected, the air gradually recedes as inflation is discontinued, the drum-head again becomes retracted, the auditory bones lose their due tension, and the hearing is again dulled. This condition may exist many years, insidiously increasing, the variations gradually becoming less frequent, when an unfavorable sign will show itself—ability to hear better in a noise.

The symptoms usually consist of "stuffiness" or "fullness" in the nose, ear, or head, the ears particularly having a "stopped up" feeling. The nose and throat are more or less uncomfortable, with periodical attacks of acute catarrh. Pain is absent, and there is no suppuration, and very little ceruminous secretion, the auditory canal having, in fact, a dry polished appearance. "Cold in the head" produces an exacerbation of all the symptoms, except in atrophic or dry catarrh, when patients usually find the hearing improved during the "running" stage of a cold. Tinnitus of varying degrees invariably exists, and sometimes proves more annoying than the deafness. Syphilis, by its action in producing naso pharyngeal catarrh in young adults, is an important cause, which must not be overlooked. The more insidiously the deafness increases, the more hopeless it is, for, apart from the fact that considerable and irremediable changes in the middle ear may occur before the patient is aware of his deafness, it may continue to increase despite the most discriminating treatment. Such cases are often seen in several members of a family; gout and rheumatism are more or less present; and young and anæmic women, exhausted by pregnancies and suckling, or suffering from uterine disease, are the victims of this form of deafness, which is always aggravated by worry and emotion. One of the most distinguishing symptoms of chronic aural catarrh, particularly of the sclerotic form, provided the auditory nerve is not implicated, is the loudness with which the patient hears his own voice; it will sound as though he were speaking with his head in a box, and cause unpleasant reverberation in conversation.

In dealing with these cases, the objects to be striven for are:—

Reduction of the catarrh.
Free ventilation of the middle ear.
Breaking down of the adhesions; and
Restoration of the drum-head to its normal position.

Nasal injections and gargles, with the use of antiseptic ointments and paints will often work considerable benefit (see these chapters).

Inflation of the ear with the Politzer bag, or fumigation with various vapours, serve to ventilate the middle ear, and break down adhesions, as well as restore the drum-head to its right position. If the Eustachian tube be obstructed, so that inflation produces no effect on the middle ear, then the catheter will be required; if, on the other hand, the tube be unusually pervious, the use of certain essential oils injected through the catheter will do much good, although occasionally rendering the hearing temporarily worse. The detection and treatment of adenoids, enlarged tonsils, deviations, hypertrophy, etc., all require attention, without which no improvement to the hearing will occur. Inflation by Valsalva's method with different vapours (see chapter on fumigation) is highly beneficial, provided it be done in a gentle and prolonged manner; force being avoided. Valsalva's method of inflation has been much condemned because patients use it too violently and too often, but properly and moderately used it is a valuable adjunct, and if the ears be stopped with the thumbs at the moment of inflation, the fear of bringing about flaccidity of the drum-heads by constant fumigation, is rendered partly groundless. With regard to the injection of medicated solutions through the catheter, opinions vary as to their utility, and some aurists even condemn them. Some cases are undoubtedly benefited, and the writer has improved many apparently intractable cases by this method; it is not, however, suitable for self-treatment.

The writer desires to call attention to the misuse of the Chloride of Ammonium vapour; it is not indicated in all cases, but is most useful in moist catarrh, and recent cases, and combined with Pinol or Eucalyptus oil, it may do good in a few cases of dry catarrh. A special form of apparatus is required for the generation of this vapour, and the one manufactured by Messrs. Godfrey and Cooke of

Conduit St., is undoubtedly the best of its kind, rendering the vapour non-irritant.

Although the prognosis of chronic aural catarrh is so unfavourable, there are few cases that will not derive a certain degree of improvement from persistent treatment, and it must always be borne in mind, that even a slight mitigation will be welcomed by the patient and his friends. Thus, in suitable cases, the long continued use of Chloride of Ammonium inflation, will benefit the nose and throat, keep patent the Eustachian tube, as well as give it tone, break down adhesions in the middle ear, and disperse lymphatic deposition, as well as stimulate the auditory nerve; but it is not a panacea for deafness, any more than are artificial drums.

Chronic catarrhal deafness, will vary from day to day, depending upon the weather, the state of the secretions, the mental and physical condition, and a number of reflex actions depending on remote causes, or on the degree of faucal irritation. Perfect cure of an advanced case *has never been accomplished*, but mitigation is the rule rather than the exception, by persistent treatment. Deafness is a slow disease in its inception, onset, progress and cure, and patients should bear in mind that as long a treatment may be necessary to the betterment of the hearing power, in some cases, as will equal the time the deafness took in reaching its maximum.

Careful attention to the general health is absolutely necessary. Certain drugs are useful, as Iodide of potassium, and Strychnine; but Quinine should never be taken. Pure dry mountain air does good, but sea-air, as a rule, aggravates the catarrh.

Exposure to wet, and bathing and diving are prejudicial.

Galvanism is much overrated. The question is: how can chronic inflammatory products be affected by electrical currents? This is a fertile field for tho charlatan, but even highly-skilled electrical experts have failed to improve the hearing by this means. Certain operations are possible on the drum-head and ossicles, but they are entirely experimental, and may make the hearing worse, and are not adapted for self-treatment.

The moist form of chronic aural catarrh is usually complicated by paresis of the tympanic muscles; adhesions and pseudo-membranes form, so that parts usually separate come into contact and after a time unite, and in this way the middle ear may be so hopelessly altered as to obliterate the free space of the cavity; and as a result of such changes, the conduction of sound through the tympanum to the labyrinth is seriously impeded. On the other hand, these changes are not so marked in sclerotic catarrh, the changes being more of the nature of atrophy, or loss of elasticity of the mucous membrane, frequently limited to the fenestral structures and recesses, and a prominent symptom is the ease with which the ear can be inflated without any improvement to the hearing. And labyrinthine disease is a more frequent attendant upon sclerotic than moist aural catarrh. Some patients complain of pain over the frontal bone, and localized head pain; these are usually reflex in character, due to the irritation to the mucous membrane of the middle ear, transmitted through the branches of the trigeminus to the nerves of the head. Giddiness, mental and nervous disturbance, with lessened power of mind concentration, and extreme depression, may all form part of the symptoms, and are indicative of disturbance of the peripheral and central parts of the nervous system in persons of low vitality. The hearing may remain stationary for several years, and then become rapidly worse, defying for a time even well directed treatment, and even after improvement, relapses are not uncommon. In certain cases of the sclerotic character it has to be confessed that treatment is of no avail, and in a few instances the deafness seems aggravated by the local treatment. In these cases we must be satisfied if we succeed in checking morbid processes in the ear, although the hearing is not improved, for by so doing the tendency to increase, so characteristic of deafness, is brought to a standstill, and the nervous symptoms, and perhaps the tinnitus, are abated. In sclerosis, the Iodine and Ether vapour is most useful, and the following vapour often does much good in both the moist and dry catarrhs: —

Creasoti	80 minims.
Magnes Carb Levis	½ drm.
Aquæ ad	2 oz. mix.

1 teaspoonful in a half pint of hot water, through a small inhaler. The vapour to be inhaled and the ears inflated.

Aural catarrh may localize itself in the middle ear, and cause little or no alteration in the condition of the Eustachian tube and such cases require very delicate handling, for the treatment designed to improve the state of the tympanum may react on the tube with evil effect, and so intensify the deafness.

Another part of the organ of hearing which requires consideration in chronic aural catarrh, is the mastoid process. It is a generally accepted opinion, that this porous structure of the ear acts as a reservoir and resonator, increasing the quantity of air in the tympanum, and equalizing to some extent, the air pressure in the middle ear; it follows therefore, if, through chronic catarrh of the tympanum, the mastoid becomes similarly affected, giving rise to organic changes, it will react on the middle ear and intensify the pathological changes of that division of the ear; there may be abnormal sensations in the mastoid as a consequence of this, which may be benefited by counter-irritation. Thus the application of a liniment, with friction to the part, as follows, will do good:—

Lin. Saponis
Lin. Camphor Co, of each ½ oz. mix.

The use of the Turkish bath has proved beneficial in many of these complicated cases, and if the ears be inflated in the hot rooms, the topical effect of the hot dry air on the middle ear, may do much good.

The most favorable cases of chronic aural catarrh are those of comparatively recent standing, and in children. With adults, however, it is otherwise. On account of the anatomical conformation of the tympanum, and its delicate mechanism, it is plain that if catarrhal processes go on for only six months, permanent damage is likely to result. The age and general health, the duration or degree of deafness, the amount of damage to the drum-head, ossicular chain, and Eustachian tube, are all obvious factors which influence the prognosis. A sudden onset due to a definite cause is more favorable, with few exceptions; but these slowly advancing cases, where no extrinsic cause is ascertainable, render the otologist comparatively powerless, even in cases of a few months' standing. Variation and fluctuation in the deafness are good signs; so, also, is improvement following inflation of the ear by any method. Pronounced tinnitus, and vertigo, and unvarying deafness, despite treatment, usually indicate cases incapable of response to ordinary therapeutics, but even these may respond to certain direct operations on the ear.

CHAPTER XXXV.

DISCHARGES (OTORRHŒA); CHRONIC SUPPURATIVE CATARRH.

A DISCHARGE from the ear is not a disease *per se*, but arises from various causes and conditions within. It is one of the commonest disorders of the ear, and is due, in fully nine-tenths of such cases, to chronic suppuration of the middle ear. It should never be regarded as a lesion that will right itself, for the longer it continues the more difficult it will be to arrest, and some incurable cases are due solely to neglect in the earlier stages. No rule, except strict cleanliness, can apply to every case, and if this be neglected it may prove the starting point, not only of great destruction of the hearing power, but may even lead to death. Consequently the importance of early and thorough treatment in all cases of ear-discharge cannot be overestimated. Wilde says: "So long as a discharge from the ear exists, we are never able to say how, when, or where it may end, nor to what it may lead." The common belief that interference with an ear-discharge may cause brain or other mischief, is totally without foundation, for the mischief to be dreaded, is the consequences of longstanding discharges, culminating in total deafness, facial paralysis, meningitis, caries, and necrosis, with mastoid complications; and the idea so common among both the profession and the laity, that children will 'outgrow' otorrhœa, is a great fallacy.

True, a few favorable cases undergo spontaneous cure, but these are exceptions, and should never be relied upon.

Otorrhœa is usually a sequela of acute inflammation, although it may be chronic from the beginning, this occasionally being the case in tubercular subjects, in whom, too, the discharge proves unusually intractable. A peculiar feature of tuberculous discharges, is the quiet onset, absence of pain, intense deafness, and slight constitutional disturbance. Scarlet fever, measles, and zymotic diseases generally, are largely responsible for most cases of otorrhœa; the specific nature of the primary acute inflammation, and its long continuance, diminishes the healing tendency, and there is greater destruction of the middle ear, with lowered vitality. By a combination of ulceration, pressure, and softening, the product of inflammation forces its way through the drum-head, and continues indefinitely through neglect, and the rupture thus proves permanent, giving rise to perforative otorrhœa which may prove incurable.

In the majority of cases of chronic otorrhœa, perforation is present; others have their source in the mastoid process, through a fistulous opening in the walls of the auditory canal, external to the drum-head; and a few cases are due to chronic eczema, or chronic otitis externa (already considered); but no other variety assumes the importance and intractability of middle ear suppuration.

The symptoms are, deafness of varied degree, depending upon the amount of change in the middle ear affecting the auditory bones, and in a lesser degree, upon the size and situation of the perforation.

Tinnitus may exist, but is rarely so marked as in non-suppurative catarrh of the middle ear, and it may be altogether absent.

The discharge of pus from the ear will assume different characters according to the cause, and condition of the tympanic cavity:—

Healthy pus is a somewhat thin and whitish secretion devoid of smell, occurring in those cases having a certain amount of cleansing, and free from pain or other serious symptoms.

Ropy or stringy discharge is seen after recent inflammation, with perforation, the admixture of mucus being a certain sign of perforation.

A thin and watery discharge, gradually lessening during the healing stage, is favorable, but if it be acrid enough to cause excoriation of the skin, with no diminution, it is a sign of neglect, and probable increase.

If blood be present, it is a sign of granulations, polypoid growth, or even polypi.

Fœtor denotes neglect, with accumulation and decomposition of the discharge, but if this fœtid condition persist despite cleanliness, and the discharge assumes a brownish colour, then bone mischief is undoubtedly present. The skin of the canal is usually inflamed and tender, or irritable; the cervical glands, especially in children, may be enlarged and tender; giddiness and head-pains are common, and the symptoms are aggravated by worry, exposure, and debility. The head-pains and giddiness are more pronounced if the tympanic cavity contains an accumulation, and this may exist although the ear be regularly cleansed, for the simple reason that ordinary syringing will only cleanse the canal, as a rule, a special device being necessary to cleanse the tympanum. Recent cases properly treated will almost certainly recover, and no case of otorrhœa, however bad, is so severe as not to be susceptible of improvement; and although there will be a few long-standing cases which defy the most discriminating treatment, tho trouble may be robbed of its worst features—fœtor, hebetude, and danger to life.

The importance of early treatment of ear-discharges, especially in children, is reiterated by way of emphasis, for experience proves that infantile discharges are peculiarly amenable to well directed and persevering treatment.

Three points must be carefully observed:—

(1). Strict cleanliness, and thorough removal of accumulations in the tympanum.

(2). Attention to the nose and throat is vital.

(3). Constitutional treatment of any departure from normal health, by hygiene and tonics.

In simple cases thorough cleansing of the ear with warm antiseptic solutions, is all that will be required, and this will allow the *vis medicatrix naturæ* to effect a cure. Such a solution is:—

Glycer. boracis
1 or 2 teaspoonfuls in a wineglass of warm water.

If this fail, a solution of sulphate of zinc will stimulate the healing process, thus:—

Zinci Sulph.	½ drm.
Glycer.	1½ oz.
Water, to	10 oz. mix.

A tablespoonful in a wineglass of warm water.

If the discharge be accompanied by pain, the following is more useful:—

Liq. Plumbi Subacet	of each ½ oz.
Liq. Morph.	
Water, to	10 „ mix.

A tablespoonful in a wineglass of warm water.

If the discharge be yellowish and copious, use:—

Acid Carbolic	30 grs.
Glycer.	½ oz.
Alcohol	3 „
Water	1 pint. mix.

A tablespoonful to be added to a wineglass of warm water.

This is also useful in fœtor, or the following:—

Zinci Sulph.	1 drm.
Glycer. ac. Carbol	½ oz.
Water	10 „ mix.

A tablespoonful to a wineglass of warm water.

All these injections may be used twice or thrice daily, and the ear should be carefully dried. Important, too, is the device for cleansing the middle ear. The ear is to be turned upwards, and filled with the warm lotion, and while in this position the ear is to be inflated; by this means, the lotion is sucked through the perforation, and washed about, in and out of the tympanic cavity. This will soften and break up accumulations, and render the subsequent syringing more effective. If these means prove useless, or if the discharge be merely lessened, then the use of instillations must be brought in. These may consist of astringents, or mild caustics, the ear to be filled with the warm solution, after syringing and drying, and allowed to remain 20 minutes at the time. Such instillations are the following:

Zinci Sulph.	4 grs.
Ac. Carbol Cryst.	2 „
Glycer. pur	½ drm.
Water, to	1 oz. mix.

or:—

Cupri Sulph.	4 grs.
Water	1 oz. mix.

Or if no inflammation, as denoted by pain and throbbing, exist, the following will do good, especially when granulations exist:—

Acid Salicylic	2 grs.
Sp. vini rect.	1 oz mix.

or:—

Ac. boracic	1 drm.
Sp. vini rect.	1 oz. mix.

or:—

Ac. Carbol Cryst.	12 grs.
Sp. vini rect.	
Water, of each	3 drms. mix.

Before using the instillations, and after syringing, the ear must be thoroughly dried. In using the last three solutions there may be slight pain, but if the drops be allowed to run out, and the ear again filled with the solution, no pain will be felt. Supposing the discharge still continues, the aid of insufflations must be summoned. These consist of certain powders in a state of very fine sub-division. The lessening of the discharge is usually the signal to discontinue the use of moist applications, and employ the "dry method," which consists in cleansing the ear with cotton-wool twirled round a match, and then blowing in the ear such powders as boric acid, tannic acid, dermatol, iodoform, carbonate of lead, nosophen, or alumnol; or combinations of these powders, blown in through a tube, spill of paper, or a piece of rubber tubing. The inner third or more of the auditory canal must be filled, and a piece of wool inserted to keep the powder in place. Powders may be used alone, or in conjunction with the injections and instillations, but they rarely do good used alone when the discharge is copious. They may be left in the ear till the discharge soaks through, and the longer the powder can be retained the more favorable is the prognosis, but once the discharge penetrates the powder, it must be syringed out and the proccss repeated. The following combinations are effective:—

Acid Tannici	1 drm.
Pulv. Acid boric	7 „ mix.

or:—

Iodoform	2 drms.
Pulv. Ac boric	6 „ mix.

or:—

Alumnol	2 drms.
Pulv. Amyli	6 „ mix.

Boric acid, or nosophen alone, may be used, and the writer has found results, almost outrivalling boracic acid, ensue from nosophen, the only drawback being its expense (8/- the oz.).

The mode of syringing the ear has been explained in the chapter on syringing, which must be carefully performed. An antiseptic condition of the nose and throat must be observed, for discharges often prove intractable unless these parts are healthy (see chapters on nose and throat).

Discharges that defy a steady and intelligent use of the foregoing remedies, may be considered to be associated with mastoid disease, necrosis, granulations, polypi etc., and therefore are beyond the scope of self-treatment; but even these cases will be found benefited by antiseptic cleansing.

The chief reasons why otorrhœa is so often seen in children, are because it may be developed in so many different diseases peculiar to childhood, and because it is so often neglected. If a small cavity of the human body, bordering in a similar manner on so many important organs as the ear, were left to itself in a state of active suppuration, the most disastrous consequences would be feared; yet, it is seen, how little considered are the possible—nay, probable—evil consequences of aural suppuration, to the brain, eye, and, in some cases, the power of speech. This point has been dwelt upon with a view to impress the reader with the importance of early remedial treatment, for those who allow infantile discharges to continue unchecked, accept a grave responsibility, which even ignorance can hardly justify.

Counter-irritation behind the ear is useful in chronic cases in conjunction with local treatment, but will aggravate matters used alone, such counter-irritation may be applied in the form of a small blister, or the daily use of Iodine ointment. Only within certain limits is it possible to hit upon the most suitable remedy at first, hence the desirability of frequent change in the treatment; a remedy long continued, loses its effect for good or bad, but well judged variation is greatly efficacious.

In cases where a permanent perforation is left behind, the artificial drum should be cautiously tried, both to protect the middle-ear and improve the hearing. If the hearing still continue defective after the purulent process has ceased, medicated inflation should be carried out, which will improve the tension of the auditory bones, and separate soft adhesions.

For delicate children, during or after discharges from the ear, the following is eminently useful:—

Syr. Ferri Iodid
Syr. Phosphat Co. of each, 2 oz. mix.

One teaspoonful in a little water thrice daily after food; or the following:—

Syr. Ferri Iodid	3 drms.
Syr. aurantii	½ oz.
Aq. Anethi to	6 oz. mix.

⅙ thrice daily. Or Nourry's iodinated wine will do good.

Forcible syringing, and the use of such injections as tea, milk and water, etc., are harmful. Milk especially, as before stated, contains organic material, which may decompose in the ear, and aggravate the discharge it is designed to correct, by setting up a fresh access of inflammation. For those who cannot afford much expense, the use of common salt in the proportion of a saltspoonful in a wineglass of warm water, will prove antiseptic, and astringent, and cannot possibly do any harm. Or a saltspoon of borax or boracic acid in a wineglass of warm water is equally effective. If, during an inflammation of the ear, mastoid complications are induced (protuberance behind ear), medical advice should at once be taken, as this is far too serious for self-treatment.

CHAPTER XXXVI.

PERFORATION OF THE DRUM-HEAD.

INJURIES to the drum of the ear are very common, as might be inferred from its delicate structure and exposed position.

Ruptures are the injuries mostly occurring, and they may be produced by wounds from sharp instruments, introduced into the ear designedly or by accident; or attempts to remove a foreign body may cause perforation; rupture also occurs from loud concussions, such as the explosion of cannon or guns, and "boxes on the ear." Violent coughing, and the introduction of hot or caustic liquids into the ear, and too forcible syringing, will also cause perforation. Fracture of the base of the skull may rupture the drum-head, in which case there is usually some internal-ear complication as a result of the violence. Sea-bathing, diving, etc., may also cause rupture, by producing too great a pressure on the drum-head acting from without.

In recent and simple cases, the perforation will heal if left alone, the regenerative power of the drum being very great, the only necessary precaution being to close the ear by the insertion of a piece of antiseptic wool. This, however, depends upon the size of the perforation and its position, and the existence of previous ear-disease. The size may vary from a pin's point to a large jagged opening; and it may occur in the upper part of the drum (membrana flaccida), or the centre, in which case the healing of the rupture is much less likely, as also in the case of previous ear trouble.

Perforations resulting from middle-ear disease form the majority of cases, and constitute the most intractable, as they are usually complicated with chronic otorrhœa. The signs of a perforation are:—The existence of mucus in the discharge. A chronic discharge is nearly always a sign of perforation. If, on syringing the ear the liquid pass to the nose or throat, this is an infallible sign. If the air can be heard passing through the ear with a peculiar blowing, or whistling or squealing sound, perforation may be relied on. The Eustachian tubes may be impervious, rendering this test useless, but if they are open, a perforation may be absolutely diagnosed by filling the ear with warm liquid, and inflating with the ear turned upwards, when the fluid will "bubble," proving that the air has passed through the perforation and the liquid. The two most general tests of a perforation, are either seeing or hearing it. Another reliable test is improvement of the hearing by syringing.

The relation of perforation to the hearing power is widely misunderstood. The truth is, that perforation *per se* is not very injurious to the hearing, and in some cases a perforation may even be more favorable than thickening or adhesions. The degree of deafness will vary from hardness of hearing, which is scarcely observable, to intense deafness; and this will depend on the condition of the middle-ear, and the auditory bones. In those cases preceded by inflammation of the middle-ear, more or less injury to or destruction of the ossicles may occur, or the perforation may be in such a position as to cause the chain of auditory bones to lose their due tension, and fall outwards, thus interfering with their mobility. The last condition may, however, be greatly improved by the use of an artificial drum, presently to be described.

Entire destruction of the drum-head would not cause complete deafness, and not necessarily very intense deafness. By far the worst cases are those caused by suppurative processes in the tympanic cavity, set up by zymotic disease. Such is a type of scarlet fever deafness, which has worked such havoc in the auditory apparatus of so many people.

Special attention may be directed to "quiescent perforations." These are those cases occurring in adults, who have previously suffered from a discharge, which has been arrested. Such patients should be warned against continually syringing the ear, or allowing water to enter the ear, as in bathing. Not only may the discharge be resumed by such practices, but there is grave danger of middle-ear inflammation, which may prove fatal. A noted judge lost his life in this way. Cleansing the ear with dry boracic acid wool and occasionally syringing gently with an antiseptic solution, is usually all that is required, together with the use of artificial drums. It must be remembered that a small quantity of mucus will make its way into the ear through the perforation, from time to time, because the tympanum is lined with mucous membrane, but this does not constitute a discharge unless it run from the ear. All cases of perforation are affected by the weather, the state of the secretions, and the general health, which will cause a varying hearing power from day to day. It has been found that patients with medium-sized perforations hear better, as a rule, than when the perforations are very small, because, as explained by Politzer, in the former case, the sonorous waves, avoiding the drum-head, malleus and incus, pass through the perforation directly to the base of the stapes, and so reach the labyrinth to quite an extent. A long-existing perforation will never, or rarely, heal, whether or not it be complicated by otorrhœa, but recent ones are favorable, provided they are not improperly treated. Once the patient is convinced that a perforation, large or small, exists, it will repay him to carefully read the next chapter, and intelligently and carefully carry out the instructions for applying the artificial drums.

It may be here remarked (although foreign to the purpose of a book devoted to self-treatment), that artificial perforation of the drum-head will often do good in chronic thickening; the only difficulty being to keep such perforation open, so quickly will it heal. For accumulation of secretion in the tympanum, threatening rupture of the drum-head, timely puncture will evacuate the cavity and save great destruction of the middle-ear, without rupture—such rupture partaking of the nature of a fistulous opening with uncertainty as to healing. By way of emphasis the writer repeats that perforation by no means involves a high degree of impairment of hearing, although the opposite view is commonly taken by both the laity and the profession. Many people have perforation on both sides, and suffer no inconvenience, not even being considered "hard of hearing."

Recent cases of perforation are sometimes sluggish in healing, and provided there be no inflammation or discharge, the margins of the perforation may be stimulated to heal by painting them with a solution of nitrate of silver (20 grs. to the oz. of water); or with Goulard's Extract; a camel-hair brush being used for the purpose.

CHAPTER XXXVII.

ARTIFICIAL EAR-DRUMS.

In order to neutralize the evils produced both upon the hearing and the cavity of the tympanum, by a loss of substance, or perforation of the natural drum-head, attempts were made more than 200 years ago to construct an artificial drum by which the opening might be closed, the hearing improved, and the middle-ear protected. Various substances have been used for the purpose, and aural-surgeons have proposed different methods. Delau used a piece of wood, or the heart of an onion. Tod used a small piece of lint. Itard used cotton-wool, and Yearsley moistened cotton-wool. Toynber and Politzer have used hard rubber discs, fastened to a silver wire for insertion and withdrawal; but of all the various materials which have been tried, cotton-wool has proved the most effective, and the least harmful, because it can be inserted in the ear in any size, or shape, or thickness; and because, when moistened, it is pliable, yet sufficiently firm to give ample support and pressure to the auditory bones, without risk of setting up inflammation, acting as a foreign body, which harder materials may, and often induce, and it is therefore easily adapted to such a sensitive and delicate part as the ear must always be regarded. Metallic and rigid substances are dangerous to the middle-ear, and should never be used. Yearsley discovered in 1841 the great value to be attached to artificial drums, and he was led to the discovery by a patient who showed him how he was able to improve his own hearing with a piece of paper moistened with saliva; and Yearsley substituted the wool with even greater success. The dictum that "if the stapes remains fixed in the fenestra ovalis, and light pressure be brought to bear upon it, the hearing is thereby greatly improved," originated with Yearsley, and experience has proved the correctness of the assertion. This has been seized upon, and much abused, by unscrupulous quacks, who sell manufactured "ear-drums" at fabulous prices to the credulous deaf, which are utterly unfit for the purpose, and often injure the ear. The amount of pressure exercised by an artificial ear-drum is an important factor in its use, and it is only by cotton-wool properly adjusted that this right degree of pressure can be brought about; for not merely by closing the opening in the drum-head is the hearing improved, but by pressure exerted upon some part of the chain of ear-bones, in disarticulation, or destruction of one or both of the two first bones (malleus and incus). The more these bones are disorganized or destroyed, the deeper the artificial drum must be pressed into the middle-ear.

It must be understood that artificial drums are useless in recent cases, and in very small perforations; old perforations being more benefited, as well as large ones. They also fail where all the auditory bones are destroyed, or rendered immoveable by adhesions, or lymphatic and osseous formation; for, in the latter case the effect of pressure would be *nil.* Their use is also contra-indicated in young children.

The process is as follows. A pair of Yearsley's Ear-forceps should be obtained (straight, and 3 inches long). Now take a small piece of absorbent or boracic acid wool, dip it in water, and place it on the palm of the hand, and press it flat with the finger, so pressing out the superfluous moisture, that it may represent the size of a six-penny piece, and be a little thicker. This disc should be taken up by the centre with the forceps, without altering the shape, and inserted in the ear, pushing it in *as far as it will go*, and the effect noted. An instantaneous improvement in the hearing may occur, or the pad may require further adjustment. It can then bo turned round right and left, and drawn to and fro, or pressed further in at the top, bottom, or sides, to get different degrees of pressure, with signal advantage. The hand has to be educated, and the exact spot discovered, for the efficacy will largely depend on finding the precise situation to exert pressure The most likely spot is the upper and back part of the inner wall of the tympanic. cavity, right upon the stapes; the next most likely, is the upper part of the manubrium, near the roof of the auditory canal; but the patient must carefully try different spots with different pressure, till the most favorable results are attained; for he, and only he, can secure the best effects. In fact, patients succeed far better than a surgeon, for they have their own sensations as a guide. A smaller or larger pad, or a thicker or thinner one, may be required, the six-penny piece size being merely a general standard; and it may be borne in mind, that the larger and thicker the pad, the greater the pressure. Some cases are more benefited by a long wick-shaped pad (like a piece of pointed slate pencil ¾ inch or an inch long), as advised for collapse of the meatus, but these cases are in a minority. There is great difference in the degree of irritability met with in various patients; a small number being unable to wear ear-drums on account of the sensitiveness of the ear, while others will tolerate their contact without any inconvenience. In some cases a discharge is provoked by their use, on the other hand many intractable discharges have been cured by their application, as they may be made the vehicle of astringents, ointments, powders, etc., with marked benefit, and there is the absorbent action to consider. They may be worn continually, or taken out at night, or changed once in 24 hours, according to circumstances, an important point to remember being the necessity for a moistened condition of the pad, and this moisture may be applied by dilute glycerine, or plain vaseline. Nervous people may at first tie a piece of cotton to the pad for ready withdrawal. There is another way of introducing these pads. A piece of cotton being tied to the wool, is passed through a piece of vulcanite tubing, so that the pad rests on the inner end of the tube. This is introduced, pushing the pad before it, and withdrawn, leaving the drum *in situ;* but fewer modifications are possible by this method than by using forceps.

What are the advantages? Improvement of the hearing. Diminution of tinnitus. Protection of the middle-ear. The healing action of the wool, and the applications introduced on the wool. And it will be discovered that once the pads are found to improve the hearing, the good effects will increase as time goes on. The ear should not be irritated by too long an attempt to insert them, as this may set up inflammation, neither should they be worn for too long a time at first. Some patients learn their application in one or two lessons; others, and especially nervous people, only acquire the method of insertion with difficulty. Artificial drums often have the happiest effects, rescuing deaf people from perfect solitude, and seeming almost magical in aiding the hearing; and most aurists have seen cases where patients, previously considered outside all help, and who could only hear words loudly spoken in close proximity to the ear, have been enabled to hear softly spoken words some steps away, and are thus restored to society. When the artificial drum acts efficiently, the patient will know at once by the sensation in his ear, and by such a test as the rustling of his clothes, that he is hearing better. The experience of the writer agrees with that of Politzer, that an occasional pause for a few days is often followed by still better hearing; and that good hearing may continue for some time after the removal of the pad.

It has to be confessed that a small number of cases of perforation, derive no improvement from artificial ear-drums, without apparent reason to be determined from the pathological condition of the ear, but they are probably referable to an abnormal articulation of the stapes with the fenestra ovalis, but such cases are becoming steadily less as experience increases. It must not be thought that the artificial membrane is a panacea for every kind of deafness; such is not the case, although, intelligently applied, it undoubtedly affords relief to a large majority of deaf people, among whom may be included a few who do not suffer from perforation. In these cases the improvement following the insertion of an artificial drum, is due to the pressure exerted upon some part of the ossicular chain, when its continuity is impaired, and the stapes is deprived of proper support, and fails to exercise a due amount of pressure on the fluid of the labyrinth. Menière describes such a case, where a deaf old judge had been in the habit, for sixteen years, of improving his hearing for an hour or so, by pressing a blunt gold needle against the drum-head. Menière examined the ear during such a period, and found the drum-head uninjured, and the pressure was made upon the handle of the malleus, which increased the tension of the ossicular chain. Great care is requisite in such cases, as the insertion of an artificial oar-drum, when the drum-head is sound, might result in rupturing it.

Where it is found that tinnitus aurium is lessened, with or without improvement of the hearing, by the use of artificial drums, it may be attributed to diminishment of the tension of the chain of ossicles, thus relieving pressure on the fluid of the labyrinth, such pressure being exerted on the short process of the malleus, which, being above the axis of motion of the ossicular chain, causes the lower arm (manubrium) to move outwards, and consequently draws the chain of bones with it, hence the lessened pressure on the fenestra ovalis; or, where, from a collapsed or flaccid condition of the drum-head, the vibrating unison of the ossicular chain is impaired. Briefly, it will be seen that artificial ear-drums act by assisting to pick up the sound waves passing from the atmospheric (gaseous) medium to a watery medium (fluid of the labyrinth). By equalizing the pressure on both sides of the drum-head, which is always disorganized in perforation, thus placing the ossicles, *in equilibrio;* and by restoring the tension of the ossicles, without which they cannot properly oscillate in answer to the sound-waves.

It may happen that after the insertion of an artificial ear-drum, the hearing is lessened for high, sharp sounds such as a watch tick, but greatly increased for sonorous vibrations as the human voice, and general sounds. This, of course, may be considered advantageous.

CHAPTER XXXVIII.

MENIÈRE'S DISEASE AND VERTIGO.

MOST people with impaired hearing suffer more or less with giddiness and tinnitus (vertigo), induced by pressure on the labyrinthine fluid, due to middle-ear disease, but there is a disease of the semi-circular canals (and therefore a species of nervous disease) discovered by the late Dr. Menière of Paris. The symptoms being tinnitus; giddiness or staggering gait; nausea or vomiting; and at the moment of attack, or shortly after, very decided deafness, which, in most cases proves permanent. A hitherto sound organ of hearing may suddenly become the seat of functional disturbance, giving all the appearance of cerebral disease (from which it may be distinguished by the absence of loss of consciousness), and occurring at certain intervals. After each attack the deafness may be more intense, until a state of almost total deafness occurs, when the attacks cease. The symptoms are aggravated by the sudden turning of the head, and although falling down does not usually occur, the unsteady rolling gait of some patients is very marked. The causes of Menière's disease proper, are chiefly morbid conditions of the blood, as in uræmia, gout, and syphilis, with consequent hyperæmia of the labyrinth; but it must be borne in mind, that pre-existing and long continued deafness contra-indicates Menière's disease, it being commonly understood that the term should only be applied to those cases which come on in people of previous good health, and normal hearing, in whom careful examination fails to discover signs of aural disease. When, on the other hand, Menière's symptoms co-exist with ear-disease, it may be assumed that they are called forth by excessive pressure on the fenestral membranes, affecting the fluid of the labyrinth, with resultant irritation of some brain-centre (vertigo), causing the giddiness, tinnitus, and even vomiting. For instance, a plug of wax in the ear, by its pressure on the drum-head, and ossicles, will cause all Menière's symptoms; and an abnormal condition of the middle-ear will also give rise to irritation of the auditory nerve, and induce these distressing attacks. Menière's disease also may, and often is, confounded with bilious attacks, but the former may be diagnosed by the sudden deafness, by absence of head-ache, the general malaise before and after, by the pronounced rotatory sensations, and the peculiar tinnitus. Ordinary vertigo is cured or mitigated by treatment directed to the ear-trouble causing it; but Menière's disease requires specific remedies, not only for the purpose of giving immediate relief, but for prevention of future attacks. An aperient should be taken, and the following medicine for 3 days:—

Acid Hydrobrom	4 drms.
Water, to	4 ozs. mix.

2 teaspoonfuls thrice daily. Followed by taking this mixture for a week:—

Acid Hydrobrom dil.	6 drms.
Liq. Strychnine	36 m.
Sp. Chlor.	1 drm.
Water, to	6 ozs. mix.

$\frac{1}{12}$ part in an equal quantity of water thrice daily after food.

Large doses of Quinine may succeed where small doses intensify the symptoms (Charcot), therefore the following is often very serviceable after the first week:

Quiniæ Sulph.	1 drm.
Syr. Aurant	6 drms.
Water, to	6 ozs. mix.

A tablespoonful thrice daily between meals.

Salicylate of Soda is useful in some cases, but makes others worse, it can therefore only be safely prescribed after medical examination. It should be remembered, that if the disease be allowed to run its own course, the hearing power may be totally destroyed, after which no treatment is of any avail in the least degree. Turkish baths are both preventive and remedial.

CHAPTER XXXIX.

SENILE DEAFNESS.

This arises from the insensibility occurring in the nervous tissue in advanced years. The advance of old age will tend to diminish the hearing power as the other senses, varying in different individuals, but it does not follow that senile deafness will occur to an equal extent as degeneration of other parts. Such deafness will sometimes occur in people, who, physiologically speaking, are younger than their age. Senile changes are partly due to middle-ear disease, associated with diminished functional activity of the auditory nerve, and nerve centre. Not every aged person who is deaf, is so from senile decay, for senile deafness does not occur till the patient is well advanced in years; if, therefore, an aged person has been deaf from youth or middle age, it may be assumed that the case is not one of senile deafness, even though the nervous system be the seat of the disease. The diagnosis is easy—the prognosis unfavorable; for, in addition to deafness and middle-ear disease, it will be found that the patient hears worse in a noise, which is a sign of nerve implication; and the conduction of sound through the bones of the head, as shown by a tuning fork, is either normal or diminished, whereas middle-ear disease would increase the hearing power through the skull bones, but in senile deafness this increase is counteracted by the insensibility of the nervous tissue.

Most authorities on aural disease are agreed that a certain amount of deafness, variable in degree, may slowly and insidiously develop after sixty years of age. In such cases the drum-heads are white in appearance, and the auditory canals collapsed and sometimes very dry. The sight may also be affected. The general tendency to certain changes, and the loss of nervous power and function, which follows white hair and increasing age, must seriously affect the nerve element of the internal ear, which may be accentuated in rheumatic and gouty people. All treatment is of slight use, and a continued decrease of hearing power may be looked for. Astringent gargles and moderate inflation may be slightly beneficial, and an examination and treatment of the ear for inspissated cerumen (which is common in old people through neglect as well as disease), may be the means of increasing sound perception. The latest theory concerning senile deafness (Jan. 1896) is that from the results of functional and physical examination of the ears of more than 200 old persons, and of the *post-mortem* investigation of two cases, comes the conclusion that senile deafness is not due so much to changes in the labyrinth and auditory nerves, as to trophic changes involving the ossicular joints, the intra-tympanic muscles, and ossicles, producing atrophy of the ossicles, especially the stapes, and rigidily of the chain which they form.

CHAPTER XL.

POLYPI.

These may be either nasal or aural, and the only cure lies in removal, either by certain acids, or by operation. Small aural polypi may be removed, and large ones caused to shrink, by the use of astringents, or the prolonged use of rectified spirit as an instillation, but these methods are not advisable for self-use, as the effects require careful watching. Removal by operation is efficacious if the stump be properly cauterized, and the general health attended to; for it is usually found that people suffering from polypi are of a strumous habit, or recently recovered from some debilitating or exhaustive disease; so that unless sound constitutional treatment be combined with the local treatment, polypi will repeatedly return. The subject can hardly be discussed in a work of this kind, mainly intended for self-use, but the writer considered the subject worthy of passing comment. Nasal polypi may be caused to shrink, and a return after operation prevented, by the use of a spray, thus:—

Sp. vini rect.	
Glycer. boracis, of each	1 oz.
Water, to	4 oz. mix.

or the following as a nasal paint may do much good:—

Alumnol	1 drm.
Glycer.	½ oz.
Water, to	1 oz. mix.

It being, of course, necessary that the paint be brought into actual contact with either the polypus or its originating point. The existence of small nasal polypi is often overlooked if they are not large enough to entirely obstruct the nostril, and it is a moot question, whether, in inveterate cases they do not originate in the antrum of Highmore, a sinus on a level with the inferior turbinated body of the nose; and there is undoubtedly an intimate connection between them and suppuration in the accessory cavities of the nose. Among the general or remote symptoms of nasal polypi is asthma, which has been found to owe its origin to a polypus; and in any case a tendency to asthma will be aggravated by the existence of a polypus. Cough, hay-fever, epileptiform attacks, giddiness, and nightmare may all be induced by polypi, and disappear on removal of the growths.

Aural polypi will repeatedly recur, unless the discharge which causes them be arrested; and the existence of both polypi and granulations is entirely dependent on, and caused by a pre-existing discharge. Recurrent aural polypi will often be found associated with diseased bone, and this indicates mastoid operations for removal, and thorough drainage of the parts.

CHAPTER XLI.

DEAFNESS FROM OBESITY.

As described by the late eminent aural-surgeon, Mr. Harvey, obesity will sometimes, though not often, cause middle-ear deafness through closure of the Eustachian tube, by pressure of the super-abundant fat deposited in the cellular tissue around it. The origin of the Banting treatment for obesity was due to Mr. Harvey diagnosing Mr. Banting's deafness as resulting from obesity. An anti-corpulent diet will usually restore the hearing power. All sudden and violent measures to get rid of obesity are harmful, and not the least reprehensible is the drinking of vinegar, which will impair the digestive powers. In addition to abstaining from starchy and fat-forming foods, sugars, sweet wines, and malt liquors; ample exercise, bathing, and Turkish baths should be observed. A saline aperient to keep open the portal system will also do good, and reduce most cases of adipose tissue. Local treatment will give relief, and should consist in spraying the nose and gargling, followed by gentle inflation. The spraying solution may consist of the following: —

Boracis.	
Sodii bicarb, of each	15 grs.
Listerine	2 drms.
Water, to	2 oz. mix.

and the gargle may be salt or alum, or the following:—

Acid Tannici	½ oz.
Sp. vini rect	1 oz.
Water	1 pint mix.

A tablespoonful as a gargle.

If closure of the tubes, partial or complete, exists after the reduction of the obesity, inflation with Godfrey's Cloride of Ammonium Inhaler will do good; or it may be necessary to pass the catheter, to lessen the obstruction.

The Banting treatment which was prescribed by Dr. Harvey and which gradually reduced a weight of 202 lbs. to 156 lbs., consisted of:—Breakfast, 4 or 5 ozs. of beef, mutton, kidney, broiled fish, or cold meat (except pork); a large cup of tea without milk or sugar, a little biscuit or 1 oz. of dry toast. Dinner, 5 or 6 ozs. of any fish, except salmon, any meat except pork, any vegetables except potatoes, 1 oz. of dry toast, fruit out of a pudding, any kind of poultry or game, and 2 or 3 glasses of good claret or dry sherry; Champagne, port, and beer forbidden. Tea, 2 or 3 ozs. of fruit, a rusk or two, a cup of tea without milk or sugar. Supper, 3 or 4 ozs. of meat or fish and a glass or two of claret. Bread, butter, milk, sugar, beer, potatoes, and beans forbidden.

CHAPTER XLII.

RHEUMATISM OF THE EAR.

The causes are the same which bring on the disease in other parts of the body; the principal reason which can be assigned for its affecting the fibro-muscular structure of the head, the ear or eyes, in preference to the larger joints, must be exposure to exciting causes, such as draughts of cold air on the neck and ears when overheated, or perspiring profusely; there being a rheumatic diathesis. Inflammatory affections of the ear, present the same local symptoms, whatever be the cause or specific character of the inflammation; but it is highly important to detect any special type, because although the symptoms may be similar, the required treatment is often extremely diverse; and this is very true of both gouty and rheumatic inflammations, both constituting in their acute and chronic forms a very common cause of deafness in this country. Such was Harvey's opinion.

Rheumatism chiefly attacks the fibrous structures of the middle ear, but other parts are liable to be attacked, such as the cartilage of the auricle, the periosteum, the drum-head, and the nerve-sheaths distributed to the cavity of the tympanum, and even the canals in the petrous bone. The symptoms are usually, tenderness of the scalp and temple on one side, with pain and morbid sensations in the parts about the ear—the mastoid process, the jaws and teeth, and considerable tinnitus. The auditory canal may be swollen and inflamed, also the drum-head, with loss of transparency. The hearing is more or less impaired, the throat and tonsils may be inflamed, swollen and of a livid red colour, and this may extend up the Eustachian tube. The treatment must be strictly antiphlogistic, and alcohol abstained from. A cathartic should be taken, and iodide of potassium, thus:—

Pot. Iod.	2 drms.
Decoct Sarsæ Co.	8 oz. mix.

1 oz. thrice daily after food.

Turkish baths, and warm salt water bathing are very beneficial. The local treatment should consist of leeching, or blisters behind the ear, and the ear may be filled with a warm anodyne, thus:—

Ext. Opii Liq.	3 drms.
Glycer.	1 drm.
Liq. Plumbi dil.	1 oz. mix.

To be soaked warm into the auditory canal several times daily. The throat should be gargled with:—

Zinci Sulph.	30 grs.
Syrupi mori	1 oz.
Glycer.	2 oz.
Inf. Krameriœ to	8 oz. mix.

Half fill a wineglass and fill up with hot water. The ears may be gently inflated after gargling.

After active inflammation has been subdued the ears may be gently inflated with the iodine and ether solution, if deafness still continue, and if the tinnitus does not subside.

Colchicum should be taken; as this drug has a specific action in subduing the noises proceeding from rheumatism. The prescription given in the chapter on gout is useful. The following also does good:—

Pot. Iod.	
Ammon Chlorid, of each	1½ drms.
Inf. Lupuli to	6 oz. mix.

A tablespoonful thrice daily.

CHAPTER XLIII.

GOUT AFFECTING THE EAR.

As previously stated, this is a frequent cause of deafness, although it rarely attacks the ear until it has repeatedly attacked other parts; consequently when deafness attacks a gouty patient, the aural affection may depend on this disease. Ear-trouble may occur in people in whom an expected attack of gout has failed to shew itself in the ordinary way, but lurks in the system, and as may be supposed, is more often seen in the upper and middle classes than in the working community. The general treatment is important, an anti-gout regimen being necessary, and Turkish baths indispensable. Both gout and rheumatism may affect the middle ear through their action on the joints of the ossicles. If inflammation of the auditory canal be set up, sedative instillations should be used like the following:—

Atropinæ	1 gr.
Glycer.	1 drm.
Aquæ.	1 oz. mix.

To be dropped into the ear warm.

A discharge should be treated with antiseptic lotions, and counter-irritation behind the ear, and pronounced deafness by inflation of the ears with:—

Iodine	1½ oz.
Æther Sulph.	½ oz. mix.

40 drops in a half pint of hot water, the vapour to be drawn in the mouth and driven into the ears.

In chronic gout the following mixture will do much good:—

Potass Iodi.	15 gr..
Vini Colchici	1½ drms.
Tinct Hyoscyami.	1 drm.
Inf. Calumb to	6 oz. mix.

⅙ part thrice daily.

Those joints usually affected by gout should be persistently rubbed with a stimulant lotion, in order to draw the disease from the head and ears. The following may be so used:—

Ol. Sinapis	1 drm.
Ol. Recini	2 drms.
Sp. Rosmarini	to 4 oz. mix.

CHAPTER XLIV.

SYPHILITIC DEAFNESS.

The history alone will furnish the power to correctly diagnose this form of deafness, and local treatment is, of course, useless unless the disease be treated constitutionally. In cases of acquired syphilis, the deafness is usually an extension from the naso-pharynx to the middle ear, and occasionally the internal ear is attacked in the tertiary form. The nose and throat should be treated with antiseptic nasal injections and gargles, such as:—

Pulv. Ammon Chlor.	1 oz.
„ Sacchar alb.	4 oz. mix.

1 teaspoonful in a wineglass of warm water night and morning; and gentle inflation practised.

If any discharge from the ear occur, the following injection will be beneficial:—

Zinci Sulph.	40 grs.
Lot. Nig.	10 oz. mix.

Half fill a wineglass, and fill up with hot water.

Inflation of the ears may be carried out with the following:—

Hydrarg Perchlor	1½ gr..
Sp. vini rect.	1½ oz.
Water, to	6 oz. mix.

1 tablespoonful in a half pint of boiling water through an earthenware inhaler, the vapour to be driven into the ears, and the throat gargled with some of the water. None to be swallowed. A serviceable mixture is as follows.

Hydrarg Biniodi	$\frac{3}{5}$ grs.
Pot. Iod.	1 drm.
Inf. Quassiæ	6 oz. mix.

A tablespoonful thrice daily after food.

or :—

Liq. Hydrarg Perchlor	3 drms.
Sodii Iodi.	15 grs.
Syrupi	6 drms.
Aq. men. pip. to	6 oz. mix.

$\frac{1}{6}$ thrice daily.

Congenital, more than acquired, Syphilis will produce ear-disease, and in confirmed cases all treatment proves futile, and a peculiarity of this form is an alternation of deafness with eye disease, the one improving as the other gets worse. If the syphilitic poison attack the labyrinth, as it may do in a single night, the case is comparatively hopeless. If taken promptly, repeated blistering behind the ear may minimize the evil effects, and hypodermic injections of pilocarpin may be tried, but this is an entirely expectant course. The use of pilocarpin causes free transudation from the smaller vessels, and so facilitates tissue changes, hence its presumed value when the labyrinth is attacked.

CHAPTER XLV.

EXOSTOSIS AND HYPEROSTOSIS.

These are hard rounded tumours of variable size, growing from the sides of the auditory canal, and occasionally in the middle ear. By hyperostosis is understood a diffuse growth of bony tissue resulting, as a rule, from chronic inflammation. Exostosis is more of the nature of a tumour, while hyperostosis is rather an inflammatory hypertrophy. Both growths are usually solid, but sometimes hollow. They may be of a round and smooth surface, or irregular, and may occur at the entrance of the osseous part of the auditory canal, or be located near the drum-head. Their growth is very slow, and they may cease at any point, or they may go on to complete closure of the canal. They vary in size from a millet seed to a split pea, and if opposing growths come into contact, further increase in size is usually arrested, so that a chink is left sufficient for ordinary hearing power, provided the ear be regularly cleaned to prevent accumulation of cerumen, etc. The trouble is principally met with in men of middle life who live freely, and it is symptomatic of the rheumatic and gouty diatheses. Frequent diving may start these growths, and they may be associated with chronic suppurative, or non-suppurative catarrh of the middle ear. They may be mistaken for polypi, or impacted wax, but the probe will clear up the diagnosis, as their hardness will distinguish them from other growths, and their comparative paleness from cerumen. They may exist some time before making their presence felt, which is usually by impairment of hearing power and "head" symptoms, due to accumulation of epidermis and secretion behind the growth, which forms a nucleus for accumulations, as well as an obstacle to free egress of secretion. The only cure is operation for removal, but operative treatment should not be adopted unless the canal be occluded, for if the tumours are small, or a chink left between them which may easily be kept free from *débris*, very little inconvenience will be experienced from their presence. The principal thing is cleanliness; the ear should be gently syringed with an antiseptic solution, and a camel-hair brush may be used to bring away secretion which the syringe fails to remove. Counter-irritation behind the ear may give relief to pressure symptoms. Persons troubled with these growths should visit an aurist periodically to have the ear inspected, and if necessary properly cleansed. Operation for removal is one of danger and difficulty, and should not be undertaken except as a last resource and after due deliberation, and ample reason. Virchow's views as to the etiology of bony growths in general are:—"With respect to the etiology of the hyperplastic osteomata, the fact cannot be lost sight of that local impressions were, in very many cases, the exciting cause. According to experience, entirely positive and generally very rude, mechanical injuries form the ordinary starting point of the morbid process; and as has been already shown, this process presents itself substantially as an irritative one, often even inflammatory, so that a boundary between bony products of inflammation and osteomata cannot generally be drawn."

Researches in America have brought to light the remarkable frequency of these growths in the skulls of the aborigine trans-atlantic races.

CHAPTER XLVI.

NERVE DEAFNESS.

At one time cases of nerve-disease of the ear were considered in a majority, forming fully fifty per cent. of all deaf cases, but the advance of pathological anatomy, and the means of making a differential diagnosis, have reduced the frequency of such diagnoses to a minimum—4 per thousand. Their pathology is confessedly obscure, but although it is not always possible to distinguish between diseases of the auditory nerve-centre, the nerve-trunk, or the internal ear itself, yet it is now comparatively easy to distinguish between disease of the conducting, and perceptive portions of the organ. In addition to there being no appearance of disease in the outer and middle ear, and to the demonstration of a nerve affection, by means of the tuning fork (as already explained), nerve-deafness may be further concluded to exist by the following:—

Hearing worse in a noise—sufferers from middle ear deafness hear better in a noise.

Absolute deafness, to loud shouting in extreme cases, as deafness of the middle ear rarely goes on to complete extinction of the function.

The inability to hear high notes, as a shrill whistle. Perversions of pitch are more intense, rendering music more or less discordant, and there is difficulty in distinguishing consecutive octaves.

Coexisting disturbance of adjacent nerve-centres, such as the senses of taste or smell. All these symptoms will be modified by the general history of the case, and the pre-existence, or supposed existence, of the following causes:—

Syphilis, congenital or acquired. The specific fevers; mumps. Severe mental shocks. Profound anæmia. The administration of large doses of opium, quinine, salicine, and alcohol. Paralytic affections; and fracture of the base of the skull. The immediate causes of nerve-deafness may include:—

Congenital malformations of the labyrinth, auditory nerve, or nerve-centre, where total deafness exists, caused by arrest of development in intra-uterine life; this is absolutely incurable. Hæmorrhagic exudation into the labyrinth.

Displacement of the auditory nerve expansions, due to falls, etc., whereby they may be thrown out of equilibrium, and placed in a position of temporary or permanent irritation.

Degeneration of the auditory-nerve.

Intra-cranial disease, due to disease of the nervo at the base of the brain, and less frequently of its nucleus in the medulla.

Cerebro-spinal disease, whero the inflammation passes down the sheath of the nerve.

A long continued catarrhal or suppurative process in tho tympanic cavity, which may localize itself in a secondary manner on the walls of the labyrinth, causing a lasting disturbance in the nutritive supply of the ear, and inducing atrophy of the auditory nerve, consequent upon a deficient specific excitation

Thickening and atrophy of the integuments; insufficiency of the semicircular canals; hypertrophy of the cochlearis muscle; morbid changes in the temporal bone; calcareous formations; amyloid degeneration of the auditory nerve; and frequent changes on the fenestræ ovalis and rotunda.

Atheromatous conditions of the labyrinthine artories, associated with atheroma of the cerebral blood-vessels. Purulent inflammation of the vestibule and cochlea have been known to exist. Intermittent deafness with every kind of complication is frequent, such as the deafness arising from deficient "cerebration," attacking people who are "hard of hearing," when they are desirous of hearing well, and are excited or depressed. This is due to a temporary disturbance of circulation in the brain, brought about by shock, fear, anxiety, and kindred emotions, which act by temporarily paralysing the nerve-centres. Neurotic and hysterical young females will evince varying deafness without any apparent ear-disease, shifting from one ear to the other, and partaking of the nature of a functional malady. Sexual excess may induce or intensify nerve-deafness; and women at the menopause, and during pregnancy and lactation, are liable to a form of nerve-deafness which is not dependant upon any structural alteration in the ear, but to the peculiar state of the nervous system at these periods. Degenerative disease of the kidneys and liver may set up deafness by their morbid effect on the blood, giving rise to changes in the labyrinth in predisposed persons. The poison of syphilis may attack the internal ear in a single night, and completely destroy the function of hearing. Undoubtedly, however, the greater proportion of cases of nerve-deafness is excessive pressure on the fluid of the labyrinth, exerted through the fenestral openings to the internal ear. When it is remembered that this fluid is contained in unyielding walls, it will be conceded that the delicate terminal structures of the auditory nerve must suffer, unless the pressure can be early relieved, but continued for a length of time, permanent changes and functional injury take place. Intense cases are easy of diagnosis, but slight cases give trouble to detect, because the patient will often deceive both himself and the aurist; and this is the more to be regretted, because it is these slight cases which most favorably respond to treatment, if they be early detected; although all aurists are occasionally confronted with cases of nerve-deafness which defy rational diagnosis, and treatment. The great uncertainty of the diagnosis of nerve-deafness should induce us to treat all such cases as coming under the head of combined disease of the conductive and perceptive parts of the organ. The writer has seen and successfully treated many such cases in this way; and it must not be forgotten that the slightest improvement is always welcome to the patient, and at the least the disease may be brought to a standstill. This is both scientific and humane; for those who have seen the look of blank and unutterable misery, following the assertion that the case was hopeless, would think twice before thus plunging a patient into the depths of despair. The stimulus and hope afforded by the treatment often do good, and patients will declare they hear better, and feel better for it, although the hearing shows no improvement by the ordinary tests. Every intimation of a settled boundary line is still wanting, behind which, only dullness of the brain, or of the acoustic nerve and its expansion, is imaginable In cases of complete nerve-deafness, surgical or medical treatment is nearly always out of the question, although spontaneous cures have occurred in a few instances, due to nature repairing some former mischief.

A form of nerve-deafness is produced by the effects of long continued noises, which boilermakers, blacksmiths, and others are subjected to, producing hyperæmia of the labyrinth from the constant "concussions" of sounds, by causing a permanent thrusting inwards of the stapes (3rd auditory bone) on the fluid of the labyrinth.

The successful treatment of nerve-deafness will depend upon the cause, if we are able to recognize it. Intense cases will sometimes respond to treatment, while slight cases may not yield. The writer has succeeded in improving a small percentage by the use of hypodermic injections of pilocarpine, strychnine or mercury, and it is necessary to bear in mind that constitutional treatment must never be omitted. Electricity is credited with a few wonderful "cures," but the writer coincides with the majority of ear-specialists in doubting its much vaunted efficacy. It is difficult to understand how any measureable electrical influence could be exercised upon so deeply-seated a nerve as the auditory nerve. Still, this is no reason why this somewhat capricious agent should be entirely omitted. The one exception should be those cases complicated by much tinnitus aurium; for here the use of electricity invariably aggravates the disorder.

It is not desirable to use it in a blind and thoughtless manner, but the effects should be carefully gauged as the current is cautiously administered, at first intermittently, then regularly.

Vesication, or the abstraction of blood behind the ear, may do good in paralysis of the nerve. The use of iron for anæmia; mercury and iodide of potassium in syphilis; and saline cathartics in constipation; all do good within certain limits. In those cases of secondary nerve deafness —where the morbid process has extended from the middle ear—much good may often be done by persistent fumigation with volatile vapours, and again, some mitigation may be induced by injecting the middle ear through the catheter and Eustachian tube, with certain stimulant liquids either oily or aqueous, combined with fumigation. The following solution applied to the ear on a plug of cotton wool and worn continually has been known to do good in simple torpidity of the auditory nerve, and is recommended by Politzer.

Æther Sulph.
Glycer, of each 2 drms. mix.

Finally, the writer is more disposed to credit the possible cure of certain cases of nerve-deafness, from the following case:—A young man suffering from slight deafness, from childhood, woke up one morning and found himself totally deaf. Subsequent examination revealed the fact that the tuning fork could not be heard on any part of the skull. Syphilis excluded, health fairly good; some mental strain extending over 12 months; and recent marriage. The usual remedies applied with no return of the hearing. Most of the specialists in London were consulted, as also one in Paris. Prognosis hopeless; they all agreed that the hearing power was permanently and totally destroyed, and no treatment available. This lasted 9 months, despite active local treatment and large doses of mercury, when the patient in desperation then applied to himself, daily, a certain form of treatment, which no man would be justified in applying, or dare to apply, to another, in view of an almost certain fatality. The effect of this was, that the power of hearing through the skull bones gradually returned, and at the end of 6 months was perfect, although considerable middle-ear deafness still existed. This was treated by various forms of fumigation, catheterization, Eustachian injections, and paracentesis on one side; and at the end of 18 months from the commencement of this self-imposed treatment, the hearing was sufficient for all practical purposes, though slightly less than before the total deafness set in; the left ear which had been incised, being the best of the two. After 5 years (the treatment having been discontinued), a slight return of the nerve complication occurred, but was kept in check, though not absolutely overcome, by an intermittent use of the old dangerous treatment. The case illustrates the incompleteness of modern-day aural specialism, and the palpable disinclination to leave the beaten track, displayed by those who profess to study aural disease for the good of the people.

This patient was the writer.

CHAPTER XLVII.

DEAF-MUTISM.

Dumbness may exist without deafness, as a lesion or defect in the organ of speech; but complete deafness, whether it be congenital or acquired in early childhood, cannot exist without rendering the sufferer dumb, for it is only through the ear that speech is learnt. At the same time defective power of speech may co-exist with deafness. The deafness leading to mutism may be congenital or acquired. The proofs that a new-born infant is deaf are very equivocal, and can never be substantiated till too late to be of the slightest diagnostic value, as dissection offers the only valid proof, and even this fails in many cases. "That a total deafness may exist," says Mr. Saunders, "without any "defect in the mechanism of the exterior parts of the ear, "without any defect in the membranous structure on which "the nerve is expanded, in the water which it contains, or "in the nerve itself, I have myself ascertained by dissection."

Recent investigations prove that congenital deafness is less frequent than acquired, and the pathological conditions found in the congenital form are defective formation of the outer, middle, and internal ear; such as closure of the auditory canals, absence of the fenestræ, and of the semicircular canals; or of the results of intra-uterine inflammation of the middle ear or labyrinth; and again, there may be no pathological change discoverable in any part of the ear. Hereditary taints undoubtedly exercise considerable influence in the production of both congenital and acquired deafness, although it is remarkable that only a small proportion of deaf-mutes inherit the affliction from their parents, indirect transmission being more frequent. The consanguinity of parents is considered as predisposing to both deafness and idiotcy, and in these cases, careful tests will show that the nerve apparatus is at fault.

Cases of acquired deafness are usually the sequelæ of severe and destructive inflammatory processes. They may be in the labyrinth or nerve, the result of central or cerebro-spinal meningitis, injuries, mumps, scarlet and typhus fevers, diphtheria, etc. As a consequence of these diseases pathological changes occur, such as thickening or rigidity of the fenestral membranes, adhesions, destruction of the auditory bones, or anchylosis of the stapes; and these conditions may induce such a degree of deafness as to render even loud speaking useless.

There are three distinct varieties of deaf-mutism: 1, Congenital deaf-mutism, comprising cases where the child has never heard and never spoken; 2, Early acquired deaf-mutism, where a child actually hears a little, but not well enough to speak as one of his age should; 3, Late acquired deaf-mutism where the child spoke for a longer or shorter time, but lost the power of speech with the hearing. It is often difficult to distinguish between the first and second variety, since the statements that the child for a time did hear, often depend upon slight and unreliable observations. All the causes of deaf-mutism are not known, and if the causes be appreciable in some cases, there are many which are not so, and we are forced to admit the probable existence of abnormal states of the labyrinth, the acoustic nerve, and of the brain itself, which baffle the most minute investigations, and remain inaccessible to the application of all known therapeutics.

We must especially guard against treating mutism as an entirely isolated, specific, morbid condition, as is usually done by the teachers of the deaf and dumb; the mode in which dumbness results from deafness precluding such an opinion. The child learns to speak by reproducing sounds which he hears daily, the intelligence being favorably disposed towards this process in early life. If then, the ear do not hear the sounds, the mouth cannot reproduce them, and this fact affords the obvious reason why dumbness necessarily follows deafness. Milles in his physiology says: "the formation of perfect vocal tones presupposes the possession of the sense of hearing. It is only with the greatest labour that individuals born deaf learn to utter a series of harsh sounds. The deaf and dumb owe their want of speech to their deafness. They can by great labour learn the movements of articulation by sight, but their speech is never more than a series of harsh sounds, not adapted for human society, for they want the sense of hearing to regulate their articulation. There is no nearer medium of connection between the faculties of speech and hearing than the brain, and it is not evident how nervous communications could be of use to either organ. The connection of the facial nerve with the lingual branch of the fifth can have no influence on speech or hearing; for the facial nerve has nothing to do with hearing, the lingual branch of the fifth nothing to do with speech." The effects of deafness differ in the child from the adult. A degree of deafness which would prevent speech in a child, would probably interfere but little with the intercourse of an adult—the latter retains his power of speech, because it is firmly implanted in his memory, but a child with imperfect comprehension soon forgets what must at the best be a partly unknown tongue. This emphasizes the necessity of not allowing children of defective hearing to develop into mutism, when a little trouble and loud speaking would prevent the child relying on signs and gestures to the exclusion of exercising what little hearing he possesses. We must not, too, leave out of consideration the material changes which appear under the form of regressive metamorphosis, in consequence of the want of a specific irritation of the auditory nerve, and perhaps of the brain. This in the very nature of things must be much more quickly developed in the infantile organism than in a fully grown person; thus, the same affection of the ear which simply renders an adult hard of hearing, consigns a child's whole future to a low state of social and mental development. Hence, then, the deaf-dumb person is dumb because he is deaf; or, in other words, he cannot use language, the sounds of which he has never been able to hear, and consequently could not attempt to utter. The sense of sight and hearing are, no doubt, the two most important channels by which knowledge is acquired; and a deprivation of the latter would seem on a cursory view to be a less fatal impediment to acquiring knowledge than the former; but when it is considered that a want of the sense of hearing involves the loss of the principal medium of mental intercourse,—language—it is undeniable that such a bar to intellectual improvement is doubly augmented.

It has been asserted that deaf-mutism is principally an infirmity of the poor, the result of unhealthy dwellings, bad and insufficient food, impure air, poor clothing, and all those causes which induce scrofulous manifestations. This is doubtful. Again it is stated that mutes are inferior in intellectual endowment owing to imperfect cerebral development; but except in those cases complicated with congenital or acquired defects, it will be found that deaf-mutes show great mental aptitude, taking into consideration their deprivation of one of the chief inlets of knowledge. Even among born deaf-mutes, hearing is not altogether deficient; for these that can hear sounds without distinguishing words represent $\frac{1}{10}$th of the whole; and those that can hear loud sounds such as hand-clapping, bells, cannon-firing, etc. $\frac{5}{10}$ths; and those completely deaf number $\frac{4}{10}$ths of the whole. The deaf and dumb are, however, particularly sensitive to vibration, and this is often mistaken for hearing.

The importance of an enquiry into the causes of deafness induced the directors of the Paris Institution to issue the following series of questions:—

1.—Was the child born Deaf, or has he become so since his birth?

2.—In the first case, what circumstances preceded, accompanied, or followed his birth? In the second, at what age was he found to be Deaf?

3.—Since the time of his birth till that when he lost his hearing has he suffered from any illness or met with any accident?

4.—Is the loss of hearing to be attributed to this illness or to this accident?

5.—Independent of Deafness has he any other infirmity?

6.—In this case was the infirmity anterior or posterior to the Deafness, and for how long?

7.—Had the child spoken before he lost his hearing?

8.—How many children are there in the family, and among them how many Deaf-mutes?

9.—Is the father or mother Deaf and dumb, or have they any other disease?

10.—What was the age of the father and mother at the time of the child's birth?

11.—What is their occupation?

12.—Is the residence of the parents in a flat, mountainous, or marshy country? Is it exposed to humidity or to any other peculiar atmospheric influence?

Lastly. What degree of consanguinity (if any) existed between the parents? According to Wilde this is a predisposing cause of both Deafness and idiotcy; and he further states there is little foundation for the common belief that fright experienced by a pregnant mother is a causo of congenital Deafness.

When deaf-mutes are allowed to grow up without training or education they become extremely violent and possessed of no self-restraint; and their tempers are ungovernable and their passions uncontrolled.

In diagnosing a supposed case of deaf-mutism, the child's hearing should be tested in such a way as to exclude vibration, for the feeling of touch is highly developed in deaf children, and a totally deaf child will *feel* any loud noise such as banging a door, and stamping on the floor, these being no tests whatever. A shrill whistle (being careful to avoid blowing on the child, thereby attracting attention), or a bell sounded behind its back, are useful methods of ascertaining whether there be the least hearing power. If neither the whistle nor bell attracts the notice of the child, that will practically prove that the case is one of completo nerve-deafness, and as such, hopeless. A tuning fork would be more reliable if it were possible to exclude the effect of contact with the skull, and the effect of the vibrations being *felt*. In these cases the prognosis is most unfavorable, although occasionally, nature by gradually repairing some former mischief restores the hearing sufficiently to enable the patient to acquire speech; but this rarely occurs after five years of age, and no known method will hasten or induce it.

The medical treatment of deaf-mutism is mainly confined to repairing obvious lesions, such as suppurative catarrh and the like; but when, as is principally the case, no sign of disease can be detected, there is no remedy but the educational treatment, whereby the child is removed from perfect isolation and rendered a comparatively useful member of society, for these melancholy cases become a vital question as to how they may be ameliorated. Various attempts have been made to account for the more pitiable condition of a deaf child as compared to a blind one. The blind are lively and cheerful, the deaf shy and melancholy, often suspicious and morose. "Take," says Dr. Wilson, "a boy, it may be of nine or ten years of age, who has never seen the light, and you will find him conversable and ready to give long narratives of past occurrences, etc. Place by his side a boy of the same age who has been born deaf, and observe the contrast. The latter is insensible to all you say; he smiles perhaps, and his countenance is brightened by the beams of 'holy light;' he enjoys the face of nature, may read with attention your features, and, by sympathy, reflects your smile or frown. But he remains mute; he gives no account of past experience, or of future hope. You attempt to draw something of this sort from him; he tries to understand, and to make himself understood; but he cannot. He becomes embarrassed; you feel for him, and turn away from a scene too trying, under the impression, that of those two children of misfortune, the comparison is greatly in favor of the blind, who appears by his language to enter into all your feelings and conceptions, while the unfortunate deaf-mute can hardly be regarded as a rational being; yet he possesses all the advantages of visual information as direct sensation."

The noble decree of the King of Denmark is worthy of imitation: "Every deaf and dumb child born in this kingdom, shall receive the education necessary to render him a useful member of society."

CHAPTER XLVIII.

ARTIFICIAL AIDS TO HEARING.

Up to the present, speculative mechanics have undertaken the construction of these instruments, to the exclusion of men educated in the science of acoustics, or physiological laws. So that deaf people have derived less benefit from mechanical assistance, compared with the relief afforded people with impaired vision. In other words, spectacles for the ear are yet to be made. The most useful form of aid to hearing, is undoubtedly the much ridiculed and disliked trumpet. The true design of an ear-trumpet is to collect the vibrations issuing from one direction only, excluding the rest, and it need hardly be remarked that trumpets are as useless to the totally deaf, as spectacles to the totally blind. Many people find them indispensable, others derive no benefit, or at any rate, so little assistance as not to be worth the trouble and inconvenience of daily use. They are of various sizes and shapes, and should, like spectacles, be judiciously chosen—that is, the patient should test himself with various kinds before making a final selection, and the lowest power compatible with fairly good hearing selected. Some people hear better with trumpets when the ear-piece, instead of fitting into the auditory canal, has a hollow disc to place on or over the auricle, the bones of the head are then utilized to conduct the vibrations to the labyrinth. Those made of gutta-percha deaden the sound too much, as a rule; on the other hand, metal trumpets not unfrequently produce tinnitus by their great resonance, but this may be partly remedied by inserting some loosely drawn-out wool in the outer end. The kind of deafness mostly benefited by their use, is middle-ear disease, but no definite rule can be laid down, as they may benefit the hearing of most forms of deafness, with exception of internal ear disease. For very bad cases, elastic ear-tubes, 2 or 3 feet long are useful, but are not adapted for outdoor use, nor for listening to more than one person at the time, and cannot be easily shifted about like a trumpet. The latter is undoubtedly the most useful, but is little used by sensitive persons, on account of the ridicule attached to it. It is a proof of infirmity, and seems to act as an incentive to people to shout their loudest. If a trumpet be of use at all, it will enable the patient to hear an ordinary conversational tone, but no sooner does a deaf person put up this exasperating instrument, than people consider it an invitation to "speak up." On the contrary, a quiet medium tone should be used, and the voice thrown across the wide end, not *into* the trumpet.

Most frequently, deaf people use the hand or the fingers to push the auricle forward and outward, and thus increase the reflecting surface behind, for sound waves coming from a point in front, and this is often a considerable help.

Small invisible instruments are in much request, by those disliking the use of conspicuous appliances, but they purchase their invisibility at the price of their utility, being quite unfit for the purpose. Meatus tubes inserted in the ears are useful in collapsed meatus, by giving support to the sides of the canal, but here their usefulness ends.

The Audiphone introduced from America with fair promises, has unfortunately not stood the test of experience, the results being meagre and disappointing. It consists of a thin plate of vulcanite (or card-board) rendered tense by bending. The required curvature is brought about by a cord. The teeth being applied to the upper edge with the convexity outwards, the sound waves strike upon the plate, and are carried through teeth and skull-bones, to the internal ear. The conduction of sound through the bones of the head, is the basis of this invention, therefore it is useless in disease of the labyrinth (nerve-deafness).

Theoretically, this is a sound and reasonable direction from which to gain relief, but it has only proved useful in about one in every thousand cases. What is required, is a solid substance having the property of being set in vibration by waves of sound transmitted through the air, of no greater intensity than those produced by the human voice in ordinary conversation. The audiphone possesses this property to a very small extent, and hence is useless in the majority of cases. It is more useful in enabling deaf people to hear music; but a rod of wood connecting the teeth and the musical instrument (pianoforte), has the same effect, provided the auditory nerve be healthy. Other contrivances have been invented from time to time, but all fall short of practical utility; the trumpet still holding the field. Artificial ear-drums are described in another chapter. When the patient suffers from hyperæsthesia of the acoustic nerve, the use of both trumpets and tubes will be found distressing, by increasing tinnitus, acting in much the same way as too bright a light to weak sight, and they should then be avoided. On the other hand, there is no objection to their use provided they prove comfortable and beneficial. For, by supplying its proper stimulus to the auditory nerve-sound vibrations—these appliances may prevent or delay the degeneration, which is apt to result from the deprivation of the proper nerve stimulus.

Some years ago Edison exhibited an apparatus whereby the noise made by a fly walking across a sheet of paper was made to sound like the tramp of a horse across the stable floor. Is it too great a stretch of the imagination to predict that some similar means of magnifying sound will be applied to the echo of the phonograph?

The Edison phonograph is the most wonderful invention of the age. It is the human voice and the human ear rolled into one. Recently a New York surgeon (Dr. Geo. A. Leech) invented and applied to the phonograph an apparatus for improving the hearing.

Vibrations of great intensity are applied to the mechanism of the ear, which enable deaf people to hear on the principle of *Paracusis Willsii*, but this would be useless in cases where the ossicles are deficient. Edison is himself deaf, and the writer had the honor of meeting him some years ago, and he believes that if human ingenuity can invent an apparatus, electrical or otherwise, for the benefit of deaf persons, such an invention will be the fruit of the wonderful inventive faculty of this master-spirit of the age.—But the fact remains that even Edison, with all the wealth of his original resource, cannot perform miracles, and that an instrument which will remedy partial deafness, to the same extent that deficient eyesight can be improved, is still—*non possumus!*

An ear trumpet may form a useful social weapon of defence as indicated by Goldsmith's lines on Sir Joshua Reynolds.

> "To coxcombs averse, yet most civilly steering,
> When they judged without skill, he was still hard of hearing;
> When they talked of their Raphaels, Corregios, and stuff,
> He shifted his trumpet and only took snuff."

CHAPTER XLIX.

CATHARTICS.

These are divided into aperients or laxatives, drastics, hydragogues, and cholagogues. The first act mildly. The second violently. The third and fourth, in a way that render them necessary only on medical advice. Cathartics act upon the system in different ways, and serve different purposes, but a good broad rule is to take the kind usually found to agree the best, and to effect the desired result with a minimum of discomfort and trouble. Saline, cooling or antiphlogistic cathartics increase the peristaltic action of the alimentary canal, and augment the effusion of fluids, consequently they are the most useful to take in head affections, such as deafness and catarrh.

Sir Thomas Watson says of cathartics in general:—"Purging is an expedient, which, in cases of violent inflammation, or high general fever, should scarcely ever be omitted. To keep the bowels, what is called open, forms indeed a part of the antiphlogistic regimen; but in acute inflammatory diseases, active purging is of very great service. Those two points are gained by it; the intestinal canal is freed from accumulated fæces, or other matters, which, by their bulk or acrimony might prove irritating; and at the same time, deplotion is carried on by means of the serous discharge which is produced by that large extent of mucous surface. There are some cases of inflammation in which the operation of purgative medicine is of especial benefit, *as in inflammatory affection of the head*, either external, or internal, of which part these medicines cause depletion in a very sensible manner." A safe and most useful laxative is, Extract of Cascara Sagrada Liquor, of which the maximum dose at night is one teaspoonful. It may be obtained in the form of capsules at most good chemists.

A good tonic saline aperient is the following :—

Mag. Sulph.	1 drm.
Ferri Sulph.	2 grs.
Acid Sulph. dil.	10 minims.
Sp. Chloroformi	10 minims
Aq. men. pip. to	1 oz. mix.

The above is a dose, and should be taken on rising as occasion require.

Chronic constipation may be beneficially treated with Hunyadi Janos, or Apenta water, taken fasting, and often succeeds where the most careful dieting, and other remedies fail.

CHAPTER L.

ALCOHOL AND TOBACCO.

THESE are relative evils, doing much harm to some people, but none to others. Their *abuse* is, of course, injurious to all. Alcohol will feed inflammation, and is therefore contra-indicated in inflammatory diseases of the ear; and it will also tend to induce, or increase noises in the head. The practice of drinking strong undiluted spirit is utterly bad, as in passing over the throat, the Eustachian tubes may be affected. It also increases nasal troubles by enlarging the arterioles and so causing greater obstruction in the nose. Alcohol is not a necessity, and should be dispensed with by all desirous of keeping a clear head and a healthy body.

Smoking should not be indulged in, where nose, throat, or ear treatment is being carried out, as it may clash with these operations, and minimize their remedial effects. Nor should smoke ever be exhaled through the nostrils, or snuffing be practised.

If mischief be set up by either of these habits, prudence would indicate abstention, for whereas one man may drink and smoke with impunity, another will find relaxation and irritation brought about, which cannot be without an evil effect on the ears.

An important consideration in the question of smoking is the time and place for indulgence. An atmosphere loaded with tobacco smoke is far more injurious than smoking in a well ventilated room; and spending the evening in a club-room reeking with the fumes of tobacco is especially bad for nose and throat, and consequently for the hearing.

LIST OF QUESTIONS

Intended as a guide to patients stating their own case. The number of each question only need be given.

1.—How long has the deafness existed?
2.—Did it come on gradually or suddenly?
3.—How far from each ear can a watch, or failing that, a clock be heard?
4.—Any noises? Their character? Intermittent or constant?
5.—What, in your own opinion, is the cause of the deafness?
6.—Discharge from either ear? Color? Smell?
7.—Pain in or around either ear?
8.—Any family history of deafness, parents, brothers, sisters, etc.?
9.—Does the hearing vary, and is it affected by the weather?
10.—Can a vibrating tuning fork be heard behind the ear, or on the skull bones generally, for as long as it vibrates?
11 —Can the ears be inflated and does it improve the hearing?
12.—Are the ears dry and deficient in wax?
13.—Hearing better or worse in a noise?
14.—Is, or has there been, any affection of the nose or throat?
15.—Has Quinine, Mercury or Salicine been taken in large doses?
16.—Has there been any debilitating illness within the last five years?
17.—Present condition of general health?
18.—Has treatment been tried? If so, what was its nature, and did it improve the hearing?
19.—Age? Married or single? Occupation? Name and address.

CONCLUSION

The treatment laid down in the foregoing pages cannot injure the ear or the health, and may be adopted with confidence. There would be many more cures of deafness if patients persevered with treatment, for, when we remember that the trouble is slow and insidious, and may take years in advancing, it is only reasonable to allow a lengthened period for cure or partial cure.

It must not be assumed that these remedies represent the utmost that can be done for aural disease, they are only those that can be *self-applied* with safety. Many other remedial measures may be taken by the expert; and the author desires it to be known that he is open to consultation as a practical aurist, personally or by letter. In the latter case, an attentive perusal of this book, will enable the patient to describe his case to good purpose, and receive more reliable advice if he cannot be examined.

Pars sanitatis velle sanari fuit.—(Seneca).

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